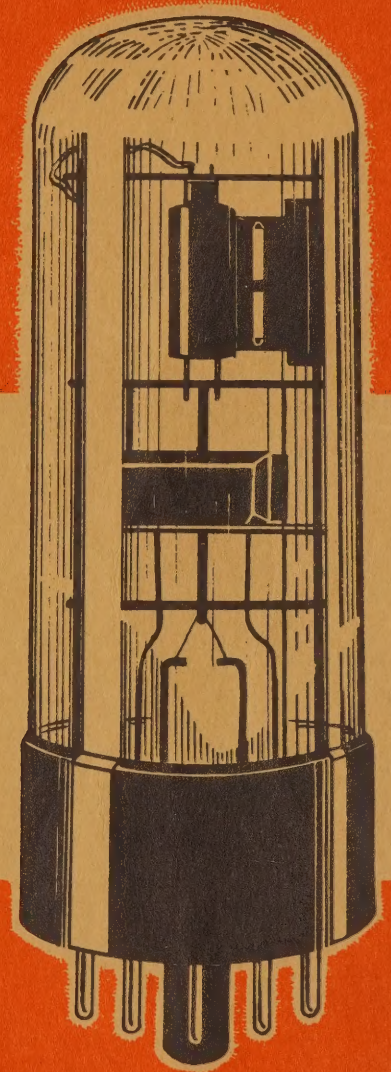


THIRD SUPPLEMENT

RECEIVING TUBE SUBSTITUTION GUIDE BOOK



FEATURING:

More than 830 receiving tube substitutions.

More than 200 picture tube substitutions.

More than 230 American to European tube substitutions.

More than 200 European to American tube substitutions.

A cumulative index listing the tube types treated in
the basic book and the 3 supplements.

BY H. A. MIDDLETON

A RIDER PUBLICATION

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THIRD SUPPLEMENT

**RECEIVING TUBE
SUBSTITUTION
GUIDEBOOK**

BY

H. A. MIDDLETON



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FOREWORD

This Third Supplement to the *Receiving Tube Substitution Guidebook*, in addition to the original volume and the First and Second Supplements to it, is an accumulation of over 15 years of experience in substituting tubes in radio and television receivers and other electronic equipment. It is a never-ending process which we shall continue in an effort to keep this information as current as possible.

Most of these additional substitutions are for use in television receivers and therefore, because of their critical application in some cases, special consideration should be given your selection when you have a choice of substitutes. A stage-by-stage discussion of the most popular circuits used in television receivers is included in the First Supplement. If there is any question as to whether or not the stage being substituted is a critical one and which characteristics of the substitute should be given special consideration, take a moment to read the article covering the stage in question.

The information herein, in the large part, calls for substitutions only. It is not the object of these instructions to tell you how to improve radios, television receivers and other electronic equipment but rather to help you use the tubes you have, in order to replace those that are not available. Exceptions to the above statements are tubes especially designed as replacements of types where improvement is needed generally or for specific use such as 5881 for 6L6, 5AW4 for 5U4G, 6CU6 for 6BQ6GT, and the same type numbers in ruggedized tubes designated by an additional ending letter, as 6SN7WGT. Types such as these are designed to improve the life of the tube, the efficiency

of the circuit in which they are applied, or both. Characteristics are generally identical to the type they replace. Elements are heavier duty or especially treated in order to withstand greater overloads and construction is more rugged.

Introduced in this Third Supplement is a European-American and American-European tube substitution guide. Due to the recent heavy influx of British and other European electronic equipment, the demand for a substitution guide for these tubes has been increasing steadily. This is due to the fact that in many instances European tubes are not readily available.

Also included in this supplement is a cumulative index indicating the volume and page where the tube you wish to substitute is located.

We have endeavored to list all the practical substitutions. Some, no doubt, have been omitted. When considering substitution, others not listed will likely come to mind. When this happens, write the tube number down immediately in the form used here and attach it in its proper place.

This supplement includes picture tube substitutions. It is recommended that before substitution of picture tube is attempted, a few moments be taken to read over the short article which precedes the picture tube section.

















Phoenix, Arizona
June 1957

H. A. Middleton






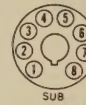

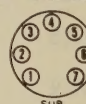


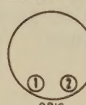
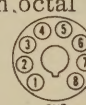

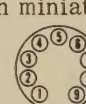
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RECEIVING TUBE SUBSTITUTIONS













TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY												
OB3	1266	E	No changes.												
1AB6	1AC6	E	Parallel circuits only. No changes.												
1AC5	1AG4	G	Change miniature socket to subminiature socket and rewire as follows: Change pin No. 4 on miniature to F-pin on subminiature. <table><tr><td></td><td>No. 2</td><td>to G1</td></tr><tr><td></td><td>No. 8</td><td>to G2</td></tr><tr><td></td><td>No. 7</td><td>to P</td></tr><tr><td></td><td>No. 5</td><td>to F +</td></tr></table> 		No. 2	to G1		No. 8	to G2		No. 7	to P		No. 5	to F +
	No. 2	to G1													
	No. 8	to G2													
	No. 7	to P													
	No. 5	to F +													
1AC6	1AB6	E	No changes.												
1AE5			No practical substitute.												
1AF4	1AJ4	G	No changes.												
1AF6			No practical substitute.												
1AG4	1AC5	G	Reverse 1AC5 to 1AG4 procedure.												
1AG5	1AJ5	G	No changes.												
	1AK5	G	No changes.												
1AH4	1AK4	E	No changes.												
1AH5			No practical substitute.												
1AH6			No practical substitute.												
1AJ4	1AF4	G	No changes.												
1AJ5	1AG5	G	No changes.												
	1AK5	G	No changes.												
1AK4	1AH4	E	No changes.												
1AK5	1AG5	G	No changes.												
	1AJ5	G	No changes.												
1AX2	1B3	E	Change socket to octal and rewire as follows: <table><tr><td></td><td>No. 2 on miniature</td><td>to No. 2 on octal</td></tr><tr><td></td><td>9</td><td>to 7</td></tr></table> 		No. 2 on miniature	to No. 2 on octal		9	to 7						
	No. 2 on miniature	to No. 2 on octal													
	9	to 7													
	1X2	E	No changes.												
1B3	2B3	P	No changes.												
1C3	1E4	G	Change socket to octal and rewire as follows: <table><tr><td></td><td>No. 1 on miniature</td><td>to No. 2 on octal</td></tr><tr><td></td><td>2</td><td>to 3</td></tr><tr><td></td><td>4</td><td>to 5</td></tr><tr><td></td><td>7</td><td>to 7</td></tr></table> 		No. 1 on miniature	to No. 2 on octal		2	to 3		4	to 5		7	to 7
	No. 1 on miniature	to No. 2 on octal													
	2	to 3													
	4	to 5													
	7	to 7													
	1LE3	G	Change socket to octal and rewire as follows: <table><tr><td></td><td>No. 1 on miniature</td><td>to No. 1 on octal</td></tr><tr><td></td><td>2</td><td>to 2</td></tr><tr><td></td><td>4</td><td>to 6</td></tr><tr><td></td><td>7</td><td>to 8</td></tr></table> 		No. 1 on miniature	to No. 1 on octal		2	to 2		4	to 6		7	to 8
	No. 1 on miniature	to No. 1 on octal													
	2	to 2													
	4	to 6													
	7	to 8													




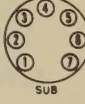

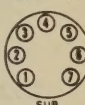

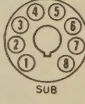


(Cont.)

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY	
1C3 (Cont.)	1LF3	G	Change socket to octal and rewire as follows:	
			No. 1 on miniature to No. 1 on octal	
			2 to 2	
			4 to 6	
			7 to 8	
				
1D3			No practical substitute.	
1E3			No practical substitute.	
1E4	1C3	G	Reverse 1C3 to 1E4 procedure.	
	1LE3	G	Rewire as follows:	
			No. 2 pin to No. 1	
			3 to 2	
			5 to 6	
			7 to 8	
				
	1LF3	E	Rewire as follows:	
			No. 2 pin to No. 1	
			3 to 2	
			5 to 6	
			7 to 8	
				
1LE3	1C3	G	Change socket to miniature and rewire as follows:	
			No. 1 on octal to pin No. 1 on miniature	
			2 to 2	
			6 to 4	
			8 to 7	
				
	1E4	E	Rewire as follows:	
			Change No. 1 pin to pin No. 2	
			2 to 3	
			6 to 5	
			8 to 7	
				
	1LF3	E	No changes.	
1LF3	1C3	G	Reverse 1C3 to 1LF3 procedure.	
	1E4	G	Reverse 1E4 to 1LF3 procedure.	
	1LE3	E	No changes.	
1M3			No practical substitute.	
1T2	1B3	G	Only where space permits, change socket to octal and rewire as follows:	
			No. 1 on subminiature to No. 2 on octal	
			2 to 7	
				
	1X2	G	Only where space permits, change socket to nine pin miniature and rewire as follows:	
			No. 1 on subminiature to No. 2 on miniature	
			2 to 9	
				
1U4	5910	E	No changes.	
1V6			No practical substitute.	
2A3	5930	E	No changes.	
2AF4	2T4	G	No changes.	
2B3	1B3	P	No changes.	
2B5			No practical substitute.	
2BN4			No practical substitute.	

RECEIVING TUBE SUBSTITUTIONS











2C22-3AV6

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY	
2C22	6J5	G	Rewire as follows:	
			Plate Cap	to pin No. 3
			Grid Cap	to pin No. 5
				
2C51	6SN7	G	Parallel circuits only. Rewire as follows:	
			Change pin No. 1	to pin No. 8 on octal
			2	to 3
			3	to 1
			4	to 2
			6	to 5
			7	to 4
			8	to 6
			9	to 7
				
	5670	E	No changes.	
2C52	12SL7	G	Parallel circuits only. No changes.	
2CB5			No practical substitute.	
2D21	2D21W	E	No changes.	
	5727	E	No changes.	
2D21W	2D21	G	No changes.	
	5727	E	No changes.	
2E22			No practical substitute.	
2T4	2AF4	G	No changes.	
2V2			No practical substitute.	
3A2	3A3	E	Change socket to octal and rewire as follows:	
			No. 2 on miniature	to No. 2 on octal
			9	to 7
				
3A3	3A2	G	Reverse 3A2 to 3A3 procedure. Use only where high voltage does not exceed 20KV.	
	3B2	G	No changes.	
	3C2	G	No changes.	
3AF4			No practical substitute.	
3AL5			No practical substitute.	
3AU6	3BA6	G	No changes.	
	3BC5	G	Rewire as follows:	
			Reverse connections on pin 2 and pin 7.	
				
	3CB6	G	Rewire as follows:	
			Reverse connections on pin 2 and pin 7.	
				
	3BZ6	G	Rewire as follows:	
			Reverse connections on pin 2 and pin 7.	
				
3AV6	3BT6	G	No changes.	

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
3B2	3A3	G	No changes.
	3C2	G	No changes.
3BA6	3AU6	G	No changes.
	3BC5	G	Rewire as follows: Reverse connections on pin No. 2 and pin No. 7.
			 
	3BZ6	G	Rewire as follows: Reverse connections on pin No. 2 and pin No. 7.
			 
	3CB6	G	Rewire as follows: Reverse connections on pin No. 2 and pin No. 7.
			 
3BC5	3AU6	G	Reverse 3AU6 to 3BC5 procedure.
	3BA6	G	Reverse 3BA6 to 3BC5 procedure.
	3BZ6	G	No changes. Tie pin No. 2 and No. 7 together.
	3CB6	G	No changes. Tie pin No. 2 and No. 7 together.
	3CF6	G	No changes. Tie pin No. 2 and No. 7 together.
3BE6			No practical substitute.
3BN4			No practical substitute.
3BN6			No practical substitute.
3BT6	3AV6	G	No changes.
3BU8			No practical substitute.
3BY6	3CS6	G	No changes.
3BZ6	3AU6	G	Reverse 3AU6 to 3BZ6 procedure.
	3BA6	G	Reverse 3BA6 to 3BZ6 procedure.
	3BC5	G	No changes.
	3CB6	G	No changes.
3C2	3A3	G	No changes.
	3B2	G	No changes.
3C4	3C5	G	Change socket to octal and rewire as follows: <div style="display: flex; justify-content: space-around;"> <div> No. 1 on miniature 2 3 5 6 </div> <div> to No. 2 on octal 3 4 8 5 </div> </div>
			 
	3Q4	G	Rewire as follows: Change pin No. 3 to pin No. 4 6 to 3
			 
	3V4	G	No changes.
3C5	3C4	G	Parallel circuits only. Reverse 3C4 to 3C5 procedure.
3CB6	3AU6	G	Reverse 3AU6 to 3CB6 procedure.
	3BA6	G	Reverse 3BA6 to 3CB6 procedure.
	3BC5	G	No changes.
	3BZ6	G	No changes.

RECEIVING TUBE SUBSTITUTIONS

3CE5-4BN6











TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
3CE5	3CB6	E	No changes.
	3CF6	E	No changes.
3CF6	3BC5	G	No changes.
	3BZ6	G	No changes.
	3CB6	G	No changes.
	3CE5	E	No changes.
3CS6	3BY6	G	No changes.
3DT6			No practical substitute.
3Q4	3C4	G	Parallel circuits only. Reverse 3C4 to 3Q4 procedure.
	3Q5	G	Change socket to octal and rewire as follows: Change pin No. 1 on miniature to pin No. 2 on octal
			<div style="display: flex; align-items: center;">  <div style="margin: 0 10px;"> <p>2 to 3</p> <p>4 to 4</p> <p>5 to 8</p> <p>6 to 3</p> <p>7 to 7</p> </div>  </div>
3S4	3C4	G	Parallel circuits only. Rewire as follows: Change pin No. 3 to pin No. 6
			<div style="display: flex; align-items: center;">  <div style="margin: 0 10px;"> <p>4 to 3</p> <p>6 to 2</p> </div>  </div>
	3Q5	G	Change socket to octal and rewire as follows: Change pin No. 1 on miniature to pin No. 2 on octal
			<div style="display: flex; align-items: center;">  <div style="margin: 0 10px;"> <p>2 to 3</p> <p>3 to 5</p> <p>4 to 4</p> <p>5 to 8</p> <p>6 to 3</p> <p>7 to 7</p> </div>  </div>
3V4	3C4	G	Parallel circuits only. No changes.
	3Q5	G	Change socket to octal and rewire as follows: Change pin No. 1 on miniature to pin No. 2 on octal
			<div style="display: flex; align-items: center;">  <div style="margin: 0 10px;"> <p>2 to 3</p> <p>3 to 4</p> <p>5 to 8</p> <p>6 to 5</p> <p>7 to 7</p> </div>  </div>
	3S4	G	Rewire as follows: Change pin No. 3 to pin No. 4
			<div style="display: flex; align-items: center;">  <div style="margin: 0 10px;"> <p>6 to 2</p> </div>  </div>
4BC5	4CB6	G	No changes. Tie pin No. 2 and pin No. 7 together.
4BC8	4BK7	G	No changes.
	4BQ7	G	No changes.
	4BS8	G	No changes.
	4BZ7	G	No changes.
	4BZ8	G	No changes.
	4CX7	G	No changes. Pins No. 8 and No. 9 are connected internally together.
4BK7	4BC8	G	No changes.
	4BQ7	G	No changes.
	4BS8	G	No changes.
	4BZ8	G	No changes.
	4CX7	G	No changes. Pins No. 8 and No. 9 are connected internally together.
4BN6			No practical substitute.



TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
4BQ7	4BC8	G	No changes.
	4BK7	G	No changes.
	4BS8	G	No changes.
	4BZ7	G	No changes.
	4BZ8	G	No changes.
	4CX7	G	No changes. Pins No. 8 and No. 9 are connected together internally.
4BS8	4BC8	G	No changes.
	4BK7	G	No changes.
	4BQ7	G	No changes.
	4BZ8	G	No changes.
	4CX7	G	No changes. Pins No. 8 and No. 9 are connected together internally.
4BU8			No practical substitute.
4BX8	4BC8	G	No changes.
	4BK7	G	No changes.
	4BQ7	G	No changes.
	4BS8	G	No changes.
	4BZ8	G	No changes.
	4CX7	G	No changes. Pins No. 8 and No. 9 are connected together internally.
4BZ7	4BC8	G	No changes.
	4BK7	G	No changes.
	4BQ7	G	No changes.
	4BS8	G	No changes.
	4BZ8	G	No changes.
	4CX7	G	No changes. Remove and tape any wires anchored on pin No. 9.
4BZ8	4BC8	G	No changes.
	4BK7	G	No changes.
	4BQ7	G	No changes.
	4BS8	G	No changes.
	4CX7	G	No changes. Remove and tape any wires anchored on pin No. 9.
4CB6	4BC5	G	No changes.
4CX7	4BC8	G	Rewire as follows: Tie pins No. 8 and No. 9 together.
4BK7		G	Rewire as follows: Tie pins No. 8 and No. 9 together.
4BQ7		G	Rewire as follows: Tie pins No. 8 and No. 9 together.
4BS8		G	Rewire as follows: Tie pins No. 8 and No. 9 together.
4BZ8		G	Rewire as follows: Tie pins No. 8 and No. 9 together.



RECEIVING TUBE SUBSTITUTIONS



4DT6-5AW4




TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
4DT6			No practical substitute.
5AM8	5AS8	G	Reverse 5AS8 to 5AM8 procedure.
5AN8	5AV8	E	Rewire as follows: Reverse connections on pins No. 1 and No. 3. Change pin No. 6 to pin No. 9 7 to 8 8 to 6 9 to 7
			 
	5U8	G	Rewire as follows: Change pin No. 2 to pin No. 9 3 to 8 7 to 3 8 to 2 9 to 7
			 
5AQ5	5V6	G	Change socket to octal and rewire as follows: No. 1 on miniature to No. 5 on octal 2 to 8 3 to 2 4 to 7 5 to 3 6 to 4
			 
5AS4	5AU4	G	No changes. If transformer will stand 1.5 amperes more.
	5AW4	G	No changes.
	5U4GA	G	No changes.
	5U4GB	G	No changes.
	5V3	E	No changes.
	5931	E	No changes.
5AS8	5AM8	G	Rewire as follows: Change pin No. 1 to pin No. 3 3 to 1 6 to 8 7 to 9 8 to 7 9 to 6
			 
5AU4	5AS4	G	No changes.
	5AW4	E	No changes.
	5R4GY	G	No changes.
	5T4	G	No changes.
	5U4G	G	No changes.
	5U4GA	E	No changes.
	5U4GB	E	No changes.
	5V3	E	No changes.
	5931	E	No changes.
5AV8	5AN8	E	Reverse 5AN8 to 5AV8 procedure.
	5U8	G	Rewire as follows: Change pin No. 1 to pin No. 8 2 to 9 3 to 1 6 to 2 7 to 7 8 to 3 9 to 6
			 
5AW4	5AS4	G	No changes.
	5AU4	E	No changes.
	5R4GY	G	No changes.
	5T4	G	No changes.
	5U4G	G	No changes.
	5U4GA	E	No changes.
	5U4GB	E	No changes.
	5V3	E	No changes.
	5931	E	No changes.

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
5AX4	5AS4	E	No changes.
	5AW4	E	No changes. If transformer will stand 1.2 amperes more.
	5T4	G	No changes.
	5U4G	G	No changes.
	5U4GA	E	No changes.
	5U4GB	E	No changes.
	5X3	E	No changes. If transformer will stand 1.3 amperes more.
	5V4	E	No changes.
	5931	E	No changes.
5AZ4	5AX4	E	No changes.
	5V4	E	No changes.
	5Y3	E	No changes.
	5Y4	G	Rewire as follows:
			Change pin No. 2 to pin No. 7
			4 to 3
			6 to 5
			 
	5Z4	E	No changes.
5B8			No practical substitute.
5BE8			No practical substitute.
5BK7	5BQ7	G	No changes.
	5BZ7	G	No changes.
5BR8			No practical substitute.
5BT8			No practical substitute.
5CG8			No practical substitute.
5CL8			No practical substitute.
5CM8			No practical substitute.
5J6			No practical substitute.
5T4	5AS4	E	No changes.
	5AW4	E	No changes.
	5R4	E	No changes.
	5U4	E	No changes.
	5U4GA	E	No changes.
	5U4GB	E	No changes.
	5V4	E	No changes.
	5931	E	No changes.
5T8			No practical substitute.
5U4G	5AS4	E	No changes.
	5AW4	E	No changes.
	5U4GA	E	No changes.
	5U4GB	E	No changes.
	5V3	E	No changes.
	5931	E	No changes.
5U4GA	5AS4	E	No changes.
	5AU4	E	No changes. If transformer will stand 1.5 amperes more.
	5AW4	E	No changes.
	5R4GY	E	No changes.
	5T4	E	No changes.
	5U4G	E	No changes.
	5U4GB	E	No changes.
	5V3	E	No changes.
	5931	E	No changes.

RECEIVING TUBE SUBSTITUTIONS









5U4GB-6AK5









TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
5U4GB	5AS4	E	No changes.
	5AU4	E	No changes.
	5AW4	E	No changes.
	5R4GT	G	No changes.
	5T4	E	No changes.
	5U4G	G	No changes.
	5U4GA	E	No changes.
	5V3	E	No changes.
	5931	E	No changes.
5U8	5AN8	G	Reverse 5AN8 to 5U8 procedure.
	5AV8	G	Reverse 5AV8 to 5U8 procedure.
5V3	5AS4	G	No changes.
	5AU4	E	No changes.
	5AW4	G	No changes.
	5U4GB	G	No changes.
5V4	5931	G	No changes.
5V6	5AQ5	E	Reverse 5AQ5 to 5V6 procedure.
5W4	5Z4	E	No changes.
	5931	G	No changes.
5X8	5AT8	E	Same as 6AT8 to 6X8 procedure.
5Y3	5AZ4	E	No changes.
	5Y3WGT	E	No changes.
	5Z4	E	No changes.
	5931	G	No changes.
5Y4	5AZ4	E	Reverse 5AZ4 to 5Y4 procedure.
	5Z4	E	No changes.
	5931	G	No changes.
5Z4	5AZ4	E	No changes.
	5V4	G	No changes.
	5W4	G	No changes.
	5Y3	E	No changes.
	5Y4	E	No changes.
	5931	G	No changes.
6AB8			No practical substitute.
6AC7	6006	G	Parallel circuits only. No changes.
	6134	E	No changes.
6AD8			No practical substitute.
6AE7			No practical substitute.
6AF4	3AF4	E	Parallel circuits only. Install 7-ohm 5-watt resistor in series with the filament.
	6T4	G	No changes.
6AG5	6186	E	No changes.
6AH6	6485	E	No changes.
6AK4	6C4	G	Where space permits:
<div style="display: flex; align-items: center; justify-content: space-around;"> <div style="text-align: center;">  <p>ORIG</p> </div> <div style="text-align: center;"> <p>Pin No. 1</p> <p>3</p> <p>5</p> <p>6</p> <p>8</p> </div> <div style="text-align: center;"> <p>to pin No. 6</p> <p>to 3</p> <p>to 7</p> <p>to 4</p> <p>to 5 & 1</p> </div> <div style="text-align: center;">  <p>SUB</p> </div> </div>			
6AK5	6AK5W	E	No changes.
	5591	E	No changes.
	5654	E	No changes.
	6096	E	No changes.

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY	
6AL5	3AL5	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with the filament.	
	6AL5W	E	No changes.	
	5726	E	No changes.	
	6058	E	No changes.	
	6097	E	No changes.	
	6663	E	No changes.	
6AL6	6BJ5	G	Parallel circuits only. Reverse 6BJ5 to 6AL6 procedure.	
	6BS5	G	Reverse 6BS5 to 6AL6 procedure.	
6AM6	6064	E	No changes.	
6AM8	5AM8	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with the filament.	
	6AS8	G	Change pin No. 1	to pin No. 3
			3	to 1
			6	to 9
			7	to 8
			8	to 6
			9	to 7
				
6AN8	5AN8	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament.	
	6AW8	G	Rewire as follows:	
			Change pin No. 1	to pin No. 3
			3	to 1
			6	to 9
			7	to 8
			8	to 7
			9	to 6
				
6AQ4			No practical substitute.	
6AQ5	6AQ5W	E	No changes.	
	6CM6	E	Reverse 6CM6 to 6AQ5 procedure.	
	6005	E	No changes.	
	6669	G	No changes.	
6AQ6	6066	E	Parallel circuits only. No changes.	
6AR8			No practical substitute.	
6AS6	6AS6W	E	No changes.	
	5725	E	No changes.	
6AS7	5998	G	Parallel circuits only. No changes.	
	6080	E	No changes.	
6AS8	5AM8	G	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament and use same procedure as 5AM8 to 6AS8.	
	6AM8	G	Reverse 6AM8 to 6AS8 procedure.	
6AT6	6066	E	No changes.	
6AT8	5AT8	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament.	
	6BR8	G	Connect pins No. 8 and No. 3 together.	
	6X8	E	Rewire as follows:	
				Change pin No. 1
			2	to 3
			3	to 6
			6	to 9
			7	to 8
			8	to 1
			9	to 7
				
6AU4	6AX4	G	No changes.	
	6BL4	G	No changes, where space permits.	
	(Cont.)			

RECEIVING TUBE SUBSTITUTIONS









6AU4-6BA6

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6AU4 (Cont.)	6U3	G	Change socket to miniature and rewire as follows: <div style="display: flex; justify-content: space-between;"> <div> No. 3 on octal 5 7 8 </div> <div> to pin No. 3 on miniature 9 5 4 </div> </div> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>
	6V3	G	Change socket to miniature and rewire as follows: <div style="display: flex; justify-content: space-between;"> <div> No. 3 on octal 5 7 8 </div> <div> to cap on miniature to pin No. 2 and 7 4 5 </div> </div> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>
	6W4	G	No changes.
6AU6	3AU6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	4AU6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	6AU6WA	E	No changes.
	5749	G	No changes.
	6136	E	No changes.
6AU8	6AW8	G	No changes.
	6BA8	G	No changes.
	6BH8	G	No changes.
	6U8	G	Parallel circuits only. Rewire as follows: <div style="display: flex; justify-content: space-between;"> <div> Change pin No. 1 2 3 6 7 8 9 </div> <div> to pin No. 8 9 1 7 2 3 6 </div> </div> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>
6AV4	6BX4	G	No changes.
	6W5	E	Change socket to octal and rewire as follows: <div style="display: flex; justify-content: space-between;"> <div> No. 1 on miniature 3 4 6 7 </div> <div> to pin No. 3 on octal 7 2 5 8 </div> </div> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>
	6X4	G	No changes.
	6X5	G	Same as 6AV4 to 6W5 procedure.
6AV6	3AV6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	6066	G	No changes.
6AW8	6AN8	G	Parallel circuits only. Reverse 6AN8 to 6AW8 procedure.
	6AU8	G	No changes.
6AX4	6AU4	G	No changes.
	6BL4	G	No changes.
6AX5	6BW4	G	Reverse 6BW4 to 6AX5 procedure.
6AX8	6U8	G	No changes.
6AZ8			No practical substitute.
6BA6	3BA6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	6BA6W	E	No changes.
	6DA6	G	Reverse 6DA6 to 6BA6 procedure.
	5749	E	No changes.
	6136	G	No changes.

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY	
6BA8	6AU8	G	No changes.	
	6AW8	G	No changes.	
	6BH8	G	No changes.	
6BC4	6AJ4	G	Rewire as follows:	
			Change pin No. 1 to pin No. 5	
			2 to 3	
			4 to 7	
			5 to 8	
			6 to 2	
			7 to 3	
			8 to 3	
			9 to 5	
				
6BC5	3BC5	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.	
6BC8	4BC8	E	Parallel circuits only. Install 3.5-ohm 5-watt resistor in series with filament.	
	5BC8	E	Parallel circuits only. Install 1.5-ohm 5-watt resistor in series with filament.	
	6BK7	G	No changes.	
	6BQ7	G	No changes.	
	6BS8	G	No changes.	
	6BZ7	E	No changes.	
	6BZ8	G	No changes.	
	X155	G	No changes.	
6BD4A	6BK4	E	No changes.	
6BD6	6DA6	G	Reverse 6DA6 to 6BD6 procedure.	
	5749	G	No changes.	
6BE6	3BE6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.	
	6BY6	G	No changes.	
	5750	E	No changes.	
6BE7			No practical substitute.	
6BE8	5BE8	E	Parallel circuits only. Install 1.5-ohm 5-watt resistor in series with filament.	
	6U8	E	Rewire as follows:	
			Change pin No. 1 to pin No. 9	
			2 to 1	
			3 to 8	
			6 to 7	
			7 to 7	
			8 to 7	
			9 to 2	
				
6BG6	6DN6	G	No changes.	
6BH5	6BD6	G	Change socket to miniature and rewire as follows:	
			Change pin No. 1 to pin No. 6 on miniature.	
			2 to 1	
			3 to 2	
			4 to 3	
			5 to 4	
			6 to 5	
			3 to 7	
				
6BJ6		G	Change socket to miniature and rewire as follows:	
(Cont.)			Change pin No. 1 to pin No. 6 on miniature.	
			2 to 1	
			3 to 7	
			4 to 3	
			5 to 4	
			6 to 5	
			3 to 2	
				

RECEIVING TUBE SUBSTITUTIONS

6BH5-6BN6

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY	
6BH5 (Cont.)	6DA6	G	Rewire as follows: Change pin No. 1 to pin No. 8 3 to 9 6 to 7	
			 ORIG	 SUB
	6SS7	G	Parallel circuits only. Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 6 on octal 2 to 4 3 to 3 4 to 2 5 to 7 6 to 8 3 to 5	
			 ORIG	 SUB
6BH6	6065	G	Parallel circuits only. Reverse 6065 to 6BH6 procedure.	
	6265	E	No changes.	
	6661	E	No changes.	
6BH8	6AU8	G	No changes.	
	6AW8	G	No changes.	
	6BA8	G	No changes.	
6BJ5	6AL6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 5 on octal 2 to 8 3 to 2 4 to 7 5 to cap 7 to 4	
			 ORIG	 SUB
	6M5	G	Change miniature socket to noval and rewire as follows: Change pin No. 1 to pin No. 2 2 to 3 3 to 4 4 to 5 5 to 7 7 to 1	
			 ORIG	 SUB
6BJ6	6DA6	G	Reverse 6DA6 to 6BJ6 procedure.	
	6662	E	No changes.	
6BJ7			No practical substitute.	
6BJ8	6BN8	G	No changes.	
6BK4	6BD4-A	E	No changes.	
6BK6	6066	G	No changes.	
6BK7	5BK7	E	Parallel circuits only. Install 2.6-ohm 5-watt resistor in series with filament.	
	6BC8	G	No changes.	
	6BQ7	G	No changes.	
	6BS8	G	No changes.	
	6BZ7	G	No changes.	
	6BZ8	G	No changes.	
	X155	G	No changes.	
6BL4	6AU4-GTA	G	No changes.	
	6AX4	P	No changes.	
6BN4	2BN4	E	Parallel circuits only. Install 6.8-ohm 5-watt resistor in series with filament.	
	3BN4	E	Parallel circuits only. Install 7-ohm 5-watt resistor in series with filament.	
6BN5			No practical substitute.	
6BN6	3BN6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.	
(Cont.)				

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6BN6 (Cont.)	4BN6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
6BN8	6BJ8	G	No changes.
6BQ6	6DQ6	E	No changes.
6BQ7	4BQ7	E	Parallel circuits only. Install 4-ohm 5-watt resistor in series with filament.
	5BQ7	E	Parallel circuits only. Install 2-ohm 5-watt resistor in series with filament.
	6BC8	G	No changes.
	6BK7	G	No changes.
	6BS8	G	No changes.
	6BZ7	G	No changes.
	6BZ8	G	No changes.
	X155	G	No changes.
6BR7	6BS7	E	Reverse 6BS7 to 6BR7 procedure.
	6C6	G	Parallel circuits only. Change socket to six pin socket and rewire as follows:



Change pin No. 2 to grid cap
 3 to No. 5
 4 to 1
 5 to 6
 7 to 2
 8 to 3
 9 to 4



6J7 G Parallel circuits only. Change socket to octal and rewire as follows:



Change pin No. 2 to grid cap on octal
 3 to No. 8
 4 to 2
 5 to 7
 7 to 3
 8 to 4
 9 to 5



6W7 G Same as 6BR7 to 6J7 procedure.

7C7 G Change socket to octal and rewire as follows:



Change pin No. 2 to pin No. 6 on octal
 3 to 7
 4 to 1
 5 to 8
 7 to 2
 8 to 3
 9 to 4



6BR8 5BR8 E Parallel circuits only. Install 3-ohm 5-watt resistor in series with filament.

6BS5 6AL6 G Change socket to octal and rewire as follows:



Change pin No. 1 to pin No. 5 on octal
 2 to 5
 3 to 8
 4 to 2
 5 to 7
 7 to cap
 9 to 4



6BS7 6BR7 E Rewire as follows:
 Change grid cap on 6BS7 to pin No. 2.

6C6
 (Cont.)

G

Change socket to six pin.

















Change pin No. 3 to pin No. 5
 4 to 1
 5 to 8
 8 to 3
 9 to 4
 7 to 2



RECEIVING TUBE SUBSTITUTIONS







6BS7-6BW7








TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6BS7 (Cont.)	6J7	G	Parallel circuits only. Change socket to octal and rewire as follows: Change pin No. 3 to pin No. 8 on octal
			<div>   </div>
	6W7	G	Same as 6BS7 to 6J7 procedure.
	7C7	G	Change socket to loctal and rewire as follows: Change pin No. 3 to pin No. 7 on octal
			<div>   </div>
6BS8	4BS8	E	Parallel circuits only. Install 3.5-ohm 5-watt resistor in series with filament.
	5BS8	E	Parallel circuits only. Install 1.5-ohm 5-watt resistor in series with the filament.
	6BC8	G	No changes.
	6BK7	G	No changes.
	6BQ7	E	No changes.
	6BZ7	G	No changes.
	6BZ8	G	No changes.
	X155	G	No changes.
6BT6	6066	E	No changes.
6BT8	5BT8	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament.
6BU5			No practical substitute.
6BU8	3BU8	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	4BU8	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
6BV7			No practical substitute.
6BV8			No practical substitute.
6BW4	6AX5	E	Change socket to octal and rewire as follows: Change pin No. 1 to No. 5 on octal
			<div>   </div>
	6V4	G	Rewire as follows: Change pin No. 9 to pin No. 3
			<div>   </div>
	7Z4	E	Change socket to loctal and rewire as follows: Change pin No. 1 to pin No. 6 on octal
			<div>   </div>
6BW7	6BX6	G	No changes.

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6BX4	6AX5	E	Parallel circuits only. Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 3 on octal 3 to 7 4 to 2 6 to 5 7 to 8
			 
	6AV4	G	Parallel circuits only. No changes.
	6X4	G	No changes.
	6X5	G	Same as 6BX4 to 6AX5.
6BX6	6BN7	G	No changes.
6BX8	4BX8	E	Parallel circuits only. Install 3.5-ohm 5-watt resistor in series with filament.
	6BC8	G	No changes.
	6BE6	G	No changes.
	6BK7	G	No changes.
	6BQ7	G	No changes.
	6BS8	G	No changes.
	6BZ7	G	No changes.
	6BZ8	G	No changes.
	X155	G	No changes.
6BY6	3BY6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	6CS6	G	No changes.
	5915	G	No changes.
6BY8			No practical substitute.
6BZ6	3BZ6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	4BZ6	E	Parallel circuits only. Install 4.7-ohm 5-watt resistor in series with filament.
	6CB6	E	No changes.
	6DE6	E	No changes.
6BZ7	4BZ7	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament.
	5BZ7	E	Parallel circuits only. Install 1.5-ohm 5-watt resistor in series with filament.
	6BC8	G	No changes.
	6BK7	G	No changes.
	6BQ8	E	No changes.
	6BS8	G	No changes.
	6BZ8	E	No changes.
	X155	E	No changes.
6BZ8	4BZ8	E	Parallel circuits only. Install 3.5-ohm 5-watt resistor in series with filament.
	6BC8	G	No changes.
	6BK7	G	No changes.
	6BS8	G	No changes.
	6BZ7	G	No changes.
	X155	E	No changes.
6C4	5610	G	No changes.
	6135	E	No changes.
6C6	6BR7	G	Parallel circuits only. Reverse 6BR7 to 6C6 procedure.
6CA5	7A5	G	Parallel circuits only. Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 7 on octal 2 to 6 3 to 1 4 to 8 5 to 6 6 to 3 7 to 2
			 

RECEIVING TUBE SUBSTITUTIONS











6CA7-6CH8

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6CA7	6L6	G	Parallel circuits only. No changes.
6CB5	6BG6	P	Rewire as follows: Change pin No. 1 to pin No. 8 4 to 5 6 to 3
			 
	6CD6	P	Same as 6CB5 to 6BG6 procedure.
6CB6	6BZ6	G	No changes.
	6DC6	G	No changes.
	6DE6	E	No changes.
6CD6	6DN6	E	No changes.
6CD7			No practical substitute.
6CE5	3CE5	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	4CE5	E	Parallel circuits only. Install 4.7-ohm 5-watt resistor in series with filament.
	6BZ6	G	Same as 6CE5 to 6CB6 procedure.
	6CB6	E	Rewire as follows: Connect pin No. 7 to pin No. 2
	6DE6	E	Same as 6CE5 to 6CB6 procedure.
6CG7	6BL7	E	Same as 6CG7 to 6SN7 procedure.
	6BX7	G	Parallel circuits only. Same as 6CG7 to 6SN7 procedure.
	6SN7	E	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 2 on octal 2 to 1 3 to 3 4 to 8 5 to 7 6 to 5 7 to 4 8 to 6
			 
	12AU7	G	Parallel circuits only. Rewire as follows: Reverse wires connected to No. 5 and No. 9
6CG8	5CG8	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament.
	6AT8	G	Rewire as follows: Connect pin No. 8 to pin No. 3
	6X8	G	Rewire as follows: No. 1 to No. 2 2 to 3 3 to 6 6 to 9 7 to 8 8 to 6 9 to 7
			 
6CH6	6132	E	No changes.
6CH7	6BC8	G	Tie pin No. 8 and No. 9 together.
	6BK7	G	Tie pin No. 8 and No. 9 together.
	6BQ7	G	Tie pin No. 8 and No. 9 together.
	6BS8	G	Tie pin No. 8 and No. 9 together.
	6BZ7	E	Tie pin No. 8 and No. 9 together.
	6BZ8	E	Tie pin No. 8 and No. 9 together.
	X155	E	Tie pin No. 8 and No. 9 together.
6CH8			No practical substitute.

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY																			
6CJ6	6CD6	G	Where space permits. Change socket to octal and rewire as follows: Change pin No. 2 to pin No. 5 on octal																			
			<table><tr><td>3</td><td>to</td><td>3</td></tr><tr><td>4</td><td>to</td><td>2</td></tr><tr><td>5</td><td>to</td><td>7</td></tr><tr><td>8</td><td>to</td><td>8</td></tr><tr><td>9</td><td>to</td><td>3</td></tr></table>	3	to	3	4	to	2	5	to	7	8	to	8	9	to	3	 			
3	to	3																				
4	to	2																				
5	to	7																				
8	to	8																				
9	to	3																				
6CL6	6677	E	No changes.																			
6CL8	5CL8	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament.																			
6CM6	5CM6	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament.																			
	5V6	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with filament. Change socket to octal. Rewire as follows: Change pin No. 1 to pin No. 4 on octal																			
			<table><tr><td>3</td><td>to</td><td>5</td></tr><tr><td>4</td><td>to</td><td>2</td></tr><tr><td>5</td><td>to</td><td>7</td></tr><tr><td>6</td><td>to</td><td>5</td></tr><tr><td>7</td><td>to</td><td>8</td></tr><tr><td>9</td><td>to</td><td>3</td></tr></table>	3	to	5	4	to	2	5	to	7	6	to	5	7	to	8	9	to	3	 
3	to	5																				
4	to	2																				
5	to	7																				
6	to	5																				
7	to	8																				
9	to	3																				
	6AQ5	G	Change socket to miniature and rewire as follows: Change pin No. 1 to pin No. 6 on miniature																			
			<table><tr><td>3</td><td>to</td><td>1</td></tr><tr><td>4</td><td>to</td><td>3</td></tr><tr><td>5</td><td>to</td><td>4</td></tr><tr><td>6</td><td>to</td><td>7</td></tr><tr><td>7</td><td>to</td><td>2</td></tr><tr><td>9</td><td>to</td><td>5</td></tr></table>	3	to	1	4	to	3	5	to	4	6	to	7	7	to	2	9	to	5	 
3	to	1																				
4	to	3																				
5	to	4																				
6	to	7																				
7	to	2																				
9	to	5																				
	6V6	G	Same as 6CM6 to 5V6 procedure.																			
	6W6	G	Parallel circuits only. Same as 6CM6 to 5V6 procedure.																			
6CM7	6CS7	G	Rewire as follows: Change pin No. 3 to pin No. 8 8 to 3																			
				 																		
6CM8	5CM8	E	Parallel circuits only. Install 2.5-ohm 5-watt resistor in series with the filament.																			
6CN6			No practical substitute.																			
6CN7			No practical substitute.																			
6CQ7			No practical substitute.																			
6CR6	6SF7	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 3 on octal																			
			<table><tr><td>2</td><td>to</td><td>5</td></tr><tr><td>3</td><td>to</td><td>8</td></tr><tr><td>4</td><td>to</td><td>7</td></tr><tr><td>5</td><td>to</td><td>6</td></tr><tr><td>6</td><td>to</td><td>4</td></tr><tr><td>7</td><td>to</td><td>2</td></tr></table>	2	to	5	3	to	8	4	to	7	5	to	6	6	to	4	7	to	2	 
2	to	5																				
3	to	8																				
4	to	7																				
5	to	6																				
6	to	4																				
7	to	2																				
6CS5	6CU5	G	Reverse 6CU5 to 6CS5 procedure.																			
	(Cont.)																					

RECEIVING TUBE SUBSTITUTIONS

6CS5-6DA6

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6CS5 (Cont.)	6K6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 4 on octal 2 to 8 3 to 5 4 to 2 5 to 7 6 to 5 7 to 8 9 to 3
			 
	6V6	G	Same as 6CS5 to 6K6 procedure.
	6W6	E	Same as 6CS5 to 6K6 procedure.
	6Y6	G	Same as 6CS5 to 6K6 procedure.
6CS6	3CS6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	6BY6	G	No changes.
6CS7	6CM7	G	Reverse 6CM7 to 6CS7 procedure.
6CU5	6CS5	G	Change socket to noval and rewire as follows: Change pin No. 1 to pin No. 2 on noval 2 to 3 3 to 4 4 to 5 5 to 6 6 to 1 7 to 9
			 
	6V6	G	Same as 6CU5 to 6W6 procedure.
	6W6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 8 on octal 2 to 5 3 to 2 4 to 7 5 to 5 6 to 4 7 to 3
			 
	6Y6	G	Same as 6CL5 to 6W6 procedure.
6CU6	6DQ6	E	No changes.
6CX7	4CX7	E	Parallel circuits only. Install 3.5-ohm 5-watt resistor in series with filament.
	6BC8	G	No changes. Tie pin No. 8 and No. 9 together.
	6BK7	G	Same as 6BC8 to 6CX7.
	6BQ7	E	Same as 6BC8 to 6CX7.
	6BS8	G	Same as 6BC8 to 6CX7.
	6BZ7	G	Same as 6BC8 to 6CX7.
	6BZ8	G	Same as 6BC8 to 6CX7.
	X155	G	Same as 6BC8 to 6CX7.
6DA6	6BA6	G	Change socket to miniature and rewire as follows: Change pin No. 2 to pin No. 1 on miniature 3 to 7 4 to 3 5 to 4 7 to 5 8 to 6 9 to 2
			 
	6BD6	G	Same as 6DA6 to 6BA6 procedure.
	6BJ6	G	Parallel circuits only. Change socket to miniature and rewire as follows: Change pin No. 2 to pin No. 1 on miniature 3 to 2 4 to 3 5 to 4 7 to 5 8 to 6 9 to 7
			 







TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6DB6			No practical substitute.
6DC6	6BZ6	G	No changes.
	6CB6	G	No changes.
	6DC6	G	No changes.
6DE6	6BZ6	G	No changes.
	6CB6	G	No changes.
	6DE6	G	No changes.
6DG6	6K6	G	Parallel circuits only. No changes.
	6V6	G	Parallel circuits only. No changes.
	6W6	E	No changes.
6DN6	6BG6	G	No changes.
	6CD6	E	No changes.
6DQ6	6BQ6	G	No changes.
	6CU6	G	No changes.
6DT6	3DT6	E	Parallel circuits only. Install 5-ohm 5-watt resistor in series with filament.
	4DT6	E	Parallel circuits only. Install 4.7-ohm 5-watt resistor in series with filament.
6F6	1621	E	No changes.
	1622	E	Parallel circuits only. No changes.
6H6	5679	G	Reverse 5679 to 6H6 procedure.
6J4	6J4WA	E	No changes.
6J5	2C22	G	Reverse 2C22 to 6J5 procedure.
6J6	5964	E	No changes.
	6101	E	No changes.
6J7	1221	E	Reverse 1221 to 6J7 procedure.
	6059	G	Reverse 6059 to 6J7 procedure.
	7000	G	No changes.
6K6	1621	E	Parallel circuits only. No changes.
	5871	G	No changes.
6K7	5732	E	No changes.
6L6	1621	G	Parallel circuits only. No changes.
	1622	G	No changes.
	5881	E	No changes.
	5932	E	No changes.
	6550	E	No changes.
6M5	6BJ5	G	Reverse 6BJ5 to 6M5 procedure.
6N7	1635	E	Parallel circuits only. No changes.
6Q5	884	E	No changes.
6S7	5732	G	Parallel circuits only. No changes.
6SA7	5961	E	No changes.
6SB7Y	5961	G	No changes.
6SG7	6006	E	No changes.
6SH7	6006	G	No changes.
6SJ7	6SJ7WGT	E	No changes.
	6006	G	No changes.

RECEIVING TUBE SUBSTITUTIONS

6SK7-7Z4





TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6SK7	6006	G	No changes.
	6137	E	No changes.
6SL7	6SL7WGT	E	No changes.
	6113	E	No changes.
6SN7	6SN7WGT	E	No changes.
	6180	E	No changes.
6SU7	6113	E	No changes.
6T4	3AF4	G	Parallel circuits only. Install 7-ohm 5-watt resistor in series with filament.
	6AF4	G	No changes.
6U3	6AU4	G	Parallel circuits only. Reverse 6AU4 to 6U3 procedure.
6U7	5732	G	No changes.
6U8	6AU8	G	Parallel circuits only. Reverse 6AU8 to 6U8 procedure.
	6AX8	G	No changes.
6V3	6AU4	G	Reverse 6AU4 to 6V3 procedure.
6V4	6BW4	G	Parallel circuits only. Reverse 6BW4 to 6V4 procedure.
6V6	1621	G	Parallel circuits only. No changes.
	1622	G	Parallel circuits only. No changes.
	5871	E	No changes.
	5992	E	No changes.
	6061	E	Reverse 6061 to 6U6 procedure.
6W2	6X2	G	No changes.
6X2	6W2	E	No changes.
6X4	6AV4	E	Parallel circuits only. No changes.
	6BX4	G	No changes.
	6X4W	E	No changes.
	6063	E	No changes.
	6202	G	No changes.
6X5	6AV4	G	Parallel circuits only. Reverse 6AV4 to 6X5 procedure.
	6BX4	G	Reverse 6BX4 to 6X5 procedure.
	6X5WGT	E	No changes.
6Y7	1635	E	No changes.
7A5	6CA5	G	Reverse 6CA5 to 7A5 procedure.
7A6	6AL5	G	Parallel circuits only. Change socket to miniature and rewire as follows:
			Change pin No. 1 to pin No. 3 on miniature
			2 to 5
			3 to 2
			6 to 7
			7 to 1
			8 to 4
7AU7	12AT7	G	Same as 7AU7 to 12AU7 procedure.
	12AU7	E	Rewire as follows:
	12AV7	G	Change pin No. 5 to pin No. 9
7C7	6BR7	G	Reverse 6BR7 to 7C7 procedure.
	6BS7	G	Reverse 6BS7 to 7C7 procedure.
7F8	7F8W	E	No changes.
7Z4	6BW4	E	Reverse 6BW4 to 7Z4 procedure.













TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY	
8AU8	8AW8	G	No changes.	
	8BA8	G	No changes.	
	8BH8	G	No changes.	
8AW8	8AU8	G	No changes.	
	6BH8	G	No changes.	
8BA8	8AU8	G	No changes.	
	8AW8	G	No changes.	
8BH8	8AU8	G	No changes.	
	8AW8	G	No changes.	
8BN8			No practical substitute.	
8CG7	8SN7	G	Same as 6CG7 to 6SN7 procedure.	
8CM7	8CS7	G	Rewire as follows:	
			Change pin No. 3 to 8	to pin No. 8 to 3
				
8CN7			No practical substitute.	
8CS7	8CM7	G	Same as 8CM7 to 8CS7 procedure.	
8SN7	8CG7	G	Same as 6CG7 to 6CSN7 procedure.	
9BM5	9BW6	G	Rewire as follows:	
			Change pin No. 1 to 2 on noval	to pin No. 2 on noval
			2 to 3	3 to 4
			3 to 4	4 to 5
			4 to 5	5 to 7
			5 to 6	6 to 8
			6 to 7	7 to 1
				
9BW6	9BM5	G	Same as 9BM5 to 9BN6 procedure. Tie pin Nos. 3 and 9 together.	
12A7			No practical substitute.	
12AB5			No practical substitute.	
12AC6	12AF6	G	No changes.	
12AD6	12AG6	G	No changes.	
12AD7	12AX	E	Parallel circuits only. No changes.	
	12SL7	G	Parallel circuits only. Change socket to octal and rewire as follows:	
			Change pin No. 1 to 2 on octal	to pin No. 2 on octal
			2 to 1	1 to 3
			3 to 3	3 to 8
			4 to 4	4 to 7
			5 to 5	5 to 6
			6 to 6	6 to 4
			7 to 7	7 to 5
			8 to 8	8 to 6
				
12AE6	12AT6	G	No changes.	
	12AV6	G	No changes.	
12AF6	12AC6	G	No changes.	
12AG6	12AD6	G	No changes.	
12AJ5			No practical substitute.	
12AQ5	12CM6	E	Reverse 12CM6 to 12AQ5 procedure.	
	(Cont.)			

RECEIVING TUBE SUBSTITUTIONS





12AQ5-12C5





TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
12AQ5 (Cont.)	12V6	E	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 5 on octal 2 to 8 3 to 2 4 to 7 5 to 3 6 to 4 7 to 5
			 
12AS5			No practical substitute.
12AT7	12A7WA 6060 6201 6679	E E E E	No changes. No changes. No changes. No changes.
12AU7	12AU7WA 5814 5963 6067 6189 6680	E E G E E E	No changes. No changes. No changes. No changes. No changes. No changes.
12AV5	12BQ6 12CU6 12DQ6	E E E	Same as 12CU6 to 12AV5 procedure. Same as 12CU6 to 12AV5 procedure. Same as 12CU6 to 12AV5 procedure.
12AV7	5965	G	No changes.
12AX7	12AD7 5751 6057 6681	E E E E	No changes. No changes. No changes. No changes.
12AY7	6072	E	No changes.
12BH7	6350	G	Reverse 6350 to 12BH7 procedure.
12BJ7			No practical substitute.
12BK5	6BK5	E	Parallel circuits only. Install 6-ohm 20-watt resistor in series with filament.
12BL6			No practical substitute.
12BQ6	6BQ6 12AV5 12CH6 12DQ6	E G E E	Parallel circuits only. Install 6-ohm 20-watt resistor in series with filament. Reverse 12AV5 to 12BQ6 procedure. No changes. No changes.
12BR7			No practical substitute.
12BV7	12BY7	E	No changes.
12BW4	6BW4 12X4	E G	Parallel circuits only. Install 7-ohm 20-watt resistor in series with filament. Parallel circuits only. Change socket to miniature and rewire as follows: Change pin No. 1 to pin No. 6 on miniature 4 to 3 5 to 4 7 to 1 9 to 7
			 
12BY7	12BV7	E	No changes.
12C5 (Cont.)	12CA5	G	No changes.

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY.
12C5 (Cont.)	12L6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 8 on octal 2 to 5 3 to 2 4 to 7 5 to 5 6 to 4 7 to 3
			 
12CA5	6CA5	E	Parallel circuits only. Install 5-ohm 20-watt resistor in series with filament.
	12C5	G	No changes.
	12L6	G	Same as 12C5 to 12L6.
12CM6	5CM6	E	Parallel circuits only. Install 14-ohm 20-watt resistor in series with filament.
12CM6	6CM6	E	Parallel circuits only. Install 14-ohm 20-watt resistor in series with filament.
	12AQ5	E	Change socket to miniature and rewire as follows: Change pin No. 1 to pin No. 6 on miniature 3 to 1 4 to 3 5 to 4 6 to 7 7 to 2 9 to 5
			 
	12V6	E	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 4 on octal 3 to 5 4 to 2 5 to 7 6 to 5 7 to 8 9 to 3
			 
12CN5			No practical substitute.
12CR6			No practical substitute.
12CS6	3CS6	E	Parallel circuits only. Install 16-ohm 20-watt resistor in series with filament.
	6CS6	E	Parallel circuits only. Install 21-ohm 20-watt resistor in series with the filament.
	6BY6	G	Parallel circuits only. Install 21-ohm 20-watt resistor in series with filament.
12CT8			No practical substitute.
12CU5	6CU5		Parallel circuits only. Install 5-ohm 20-watt resistor in series with filament.
	12L6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 8 on octal 2 to 5 3 to 2 4 to 7 5 to 5 6 to 4 7 to 3
			 
	12W6	G	Same as 12CU5 to 12L6 procedure.
12CU6	12AV5	G	Rewire as follows: Change pin No. 4 to pin No. 8 5 to 1 P. Cap to 5 8 to 3
			 
	12BQ6	E	No changes.
	12DQ6	E	No changes.

RECEIVING TUBE SUBSTITUTIONS







12D4-12X4





TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY																	
12D4	12AX4	G	No changes.																	
12DQ6	12AV5	G	Reverse 12AV5 to 12DQ6 procedure.																	
	12BQ6	G	No changes.																	
	12CU6	G	No changes.																	
12F8			No practical substitute.																	
12G4	12H4	E	Remove, connect, and tape up any wires on pin No. 2.																	
	12J5	E	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 3 on octal																	
			<div><div> ORIG</div><div><table><tr><td>3</td><td>to</td><td>2</td></tr><tr><td>5</td><td>to</td><td>3</td></tr><tr><td>4</td><td>to</td><td>7</td></tr><tr><td>6</td><td>to</td><td>5</td></tr><tr><td>7</td><td>to</td><td>8</td></tr></table></div><div> SUB</div></div>	3	to	2	5	to	3	4	to	7	6	to	5	7	to	8		
3	to	2																		
5	to	3																		
4	to	7																		
6	to	5																		
7	to	8																		
	14A4	E	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 2 on octal																	
			<div><div> ORIG</div><div><table><tr><td>3</td><td>to</td><td>1</td></tr><tr><td>4</td><td>to</td><td>8</td></tr><tr><td>5</td><td>to</td><td>2</td></tr><tr><td>6</td><td>to</td><td>6</td></tr><tr><td>7</td><td>to</td><td>7</td></tr></table></div><div> SUB</div></div>	3	to	1	4	to	8	5	to	2	6	to	6	7	to	7		
3	to	1																		
4	to	8																		
5	to	2																		
6	to	6																		
7	to	7																		
12G8			No practical substitute.																	
12H4	12G4	E	No changes.																	
	12J5	E	Change to octal and rewire as follows: Change pin No. 1 to pin No. 3 on octal																	
			<div><div> ORIG</div><div><table><tr><td>3</td><td>to</td><td>2</td></tr><tr><td>5</td><td>to</td><td>3</td></tr><tr><td>4</td><td>to</td><td>7</td></tr><tr><td>6</td><td>to</td><td>5</td></tr><tr><td>7</td><td>to</td><td>8</td></tr></table></div><div> SUB</div></div>	3	to	2	5	to	3	4	to	7	6	to	5	7	to	8		
3	to	2																		
5	to	3																		
4	to	7																		
6	to	5																		
7	to	8																		
	14A4	E	Same as 14A4 to 12G4 procedure.																	
12J5	12G4	E	Reverse 12G4 to 12J5 procedure.																	
	12H4	E	Reverse 12H4 to 12J5 procedure.																	
12J8			No practical substitute.																	
12K5			No practical substitute.																	
12L6	12W6	E	No changes.																	
	1632	E	No changes.																	
12R5	12W6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 8 on octal																	
			<div><div> ORIG</div><div><table><tr><td>2</td><td>to</td><td>5</td></tr><tr><td>3</td><td>to</td><td>2</td></tr><tr><td>4</td><td>to</td><td>7</td></tr><tr><td>5</td><td>to</td><td>5</td></tr><tr><td>6</td><td>to</td><td>4</td></tr><tr><td>7</td><td>to</td><td>3</td></tr></table></div><div> SUB</div></div>	2	to	5	3	to	2	4	to	7	5	to	5	6	to	4	7	to
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3	to	2																		
4	to	7																		
5	to	5																		
6	to	4																		
7	to	3																		
12SL7	2C52	E	Parallel circuits only. No changes.																	
12SN7	5814	G	Parallel circuits only. Reverse 5814 to 12SN7 procedure.																	
12U7			No practical substitute.																	
12V6	12CM6	E	Reverse 12CM6 to 12V6 procedure.																	
12W6	12L6	E	No changes.																	
	12R5	G	Reverse 12R5 to 12W6 procedure.																	
	1632	E	No changes.																	
12X4	12BW4	E	Reverse 12BW4 to 12Y4 procedure.																	

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
14A4	12G4	E	Reverse 12G4 to 14A4 procedure.
	12H4	E	Reverse 12H4 to 14A4 procedure.
15A6			No practical substitute.
15A8			No practical substitute.
16A5			No practical substitute.
17AV5	6AV5	E	Parallel circuits only. Install 8.7-ohm 25-watt resistor in series with filament.
	12AV5	E	Parallel circuits only. Install 7-ohm 10-watt resistor in series with filament.
	17DQ6	E	Same as 12CU6 to 12AV5 procedure.
17AX4	6AX4	E	Parallel circuits only. Install 18-ohm 20-watt resistor in series with filament.
	12AX4	E	Parallel circuits only. Install 10-ohm 20-watt resistor in series with filament.
17C5			No practical substitute.
17CA5	6CA5	E	Parallel circuits only. Install 9-ohm 20-watt resistor in series with filament.
	12CA5	E	Parallel circuits only. Install 10-ohm 20-watt resistor in series with filament.
17DQ6	6DQ6	E	Parallel circuits only. Install 9-ohm 20-watt resistor in series with filament.
	12DQ6	E	Parallel circuits only. Install 10-ohm 20-watt resistor in series with filament.
	17AV5	E	Same as 12CU6 to 12AV5 procedure.
17H3			No practical substitute.
17Z3	17AX4	E	Where space permits change socket to octal and rewire as follows: Change pin No. 4 cap to pin No. 8 on octal
			5 to 3 5 to 7 9 to 5
			 
18A5			No practical substitute.
19AU4	6AU4	E	Parallel circuits only. Install 7-ohm 30-watt resistor in series with filament.
	19X3	G	Parallel circuits only. Change socket to miniature and rewire as follows: Change pin No. 3 to pin No. 3 on miniature
			5 to 9 7 to 4 8 to 5
			 
19X3	19AU4	G	Parallel circuits only. Reverse 19AU4 to 19X3 procedure.
19X8			No practical substitute.
21A6			No practical substitute.
25AV5	25CU6	G	Reverse 25CU6 to 25AV5 procedure.
	25DQ6	G	Reverse 25DQ6 to 25AV5 procedure.
25AX4	17AX4	E	Parallel circuits only. Install 18-ohm 10-watt resistor in series with filament.
	25U4	G	No changes.
	25W4	G	No changes.
25C5	25CA5	G	No changes.
	(Cont.)		

RECEIVING TUBE SUBSTITUTIONS



25C5-1221





TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
25C5 (Cont.)	25L6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 8 on octal
			2 to 5 3 to 2 4 to 7 5 to 5 6 to 4 7 to 3
			 
	25W6	G	Same as 25L6 to 25C5 procedure.
25CA5	25C5	G	No changes.
	25L6	G	Same as 25C5 to 25L6 procedure.
	25W6	G	Same as 25C5 to 25W6 procedure.
25CD6	25DN6	G	No changes.
25CU6	25AV5	G	Rewire as follows: Change pin No. 5 to pin No. 1 cap to 5 8 to 3 4 to 8
			 
	25BQ6	E	No changes.
	25DQ6	E	No changes.
25DN6	25CD6	G	No changes.
25DQ6	25AV5	G	Same as 25CU6 to 25AV5 procedure.
	25BQ6	G	No changes.
	25CU6	G	No changes.
25L6	6046	G	No changes.
25U4	25AX4	E	No changes.
	25W4	E	No changes.
25W4	25U4	G	No changes.
25W6	25L6	E	No changes.
28D7	28D7W	E	No changes.
	1238	E	No changes.
40A1	40B2	G	No changes.
40B2	40A1	G	No changes.
50A1			No practical substitute.
50BK5	25BK5	E	Parallel circuits only. Install 84-ohm 20-watt resistor in series with filament.
X155	6BC8	G	No changes.
	6BK7	G	No changes.
	6BQ7	G	No changes.
	6BS8	G	No changes.
	6BZ7	G	No changes.
	6BZ8	E	No changes.
807	5933	E	No changes.
884	6Q5	G	No changes.
1221	6J7	G	Rewire as follows: Change socket to octal. Change pin No. 1 to pin No. 2 on octal
			2 to 3 3 to 4 4 to 5 5 to 8 6 to 7
			 

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
1238	28D7	G	No changes.
1266	OB3	G	No changes.
1621	6F6	G	No changes.
	6K6	G	Parallel circuits only. No changes.
	6L6	G	Parallel circuits only. No changes.
	6V6	G	Parallel circuits only. No changes.
	5881	E	Parallel circuits only. No changes.
1622	6F6	G	Parallel circuits only. No changes.
	6L6	E	No changes.
	6V6	G	Parallel circuits only. No changes.
	5881	E	No changes.
1631	6L6	G	Parallel circuits only. Install 7-ohm 20-watt resistor in series with the filament.
1632	12L6	E	No changes.
	12W6	E	No changes.
1633			No practical substitute.
1635	6N7	G	Parallel circuits only. No changes.
	6Y7	G	No changes.
5591	6AK5	G	No changes.
	5654	G	No changes.
5610	6C4	G	No changes.
5633	5634	E	No changes.
5634	5633	E	No changes.
5637	5646	G	Rewire as follows:
			Change pin No. 2 to pin No. 4
			3 to 3
			4 to 5
			5 to 2
			 
5638			No practical substitute.
5654	5591	G	No changes.
	6096	E	No changes.
5670	2C51	G	No changes.
	5670WA	E	No changes.
5670WA	5670	G	No changes.
5679	6H6	G	Parallel circuits only. Rewire as follows:
			Change pin No. 1 to pin No. 2
			2 to 4
			6 to 5
			7 to 8
			8 to 7
			 
5692	6180	E	No changes.
5725	6AS6	G	No changes.
	6AS6W	E	No changes.
	6187	E	No changes.
5726	6AL5	G	No changes.
	6AL5W	E	No changes.
	6058	E	No changes.
	6097	G	No changes.

RECEIVING TUBE SUBSTITUTIONS

5727-5965

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
5727	2D21	G	No changes.
	2D21W	E	No changes.
5732	6K7	G	No changes.
5749	6BA6	G	No changes.
	6BA6W	E	No changes.
5750	6BE6	G	No changes.
5751	12AX7	G	No changes.
	5751WA	E	No changes.
	6057	G	No changes.
5751WA	12AX7	G	No changes.
	5751	G	No changes.
	6057	G	No changes.
5814	12AU7	G	No changes.
	12SN7	G	Parallel circuits only. Change socket to octal. Rewire as follows:
			Change pin No. 1 to pin No. 2
			2 to 1
			3 to 3
			4 to 8
			5 to 7
			6 to 5
			7 to 4
			8 to 6
			 
	5814WA	E	No changes.
	6067	E	Parallel circuits only. No changes.
5824	6046	G	No changes.
5838	5839	E	Parallel circuits only. No changes.
5839	5838	E	Parallel circuits only. No changes.
5871	6V6	G	No changes.
	5992	G	Parallel circuits only. No changes.
5881	1621	G	Parallel circuits only. No changes.
	1622	G	No changes.
	5932	G	No changes.
5899	5900	E	No changes.
5900	5899	E	No changes.
5910	1U4	G	No changes.
5915	6BY6	G	No changes.
5930	2A3	G	No changes.
5931	5U4GB	E	No changes.
5932	6L6	G	No changes.
	5881	G	No changes.
5933	807	G	No changes.
5961	6SA7	G	No changes.
5963	12AU7	G	No changes.
5964	6J6	G	No changes.
5965	12AV7	G	No changes.

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
5992	6V6 5871	G G	No changes. Parallel circuits only. No changes.
5998	6AS7	G	Parallel circuits only. No changes.
6005	6AQ5 6AQ5W 6095	G E E	No changes. No changes. No changes.
6006	6SG7	G	No changes.
6046	25L6 5824	G G	No changes. No changes.
6057	12AX7 5751	G G	No changes. No changes.
6058	6AL5 5726	G G	No changes. No changes.
6059	6J7	G	Parallel circuits only. Change socket to octal and rewire as follows: Change pin No. 2 to cap on octal 3 to pin No. 8 4 to 2 5 to 7 7 to 3 8 to 4 9 to 5
			 
6060	12AT7 6201	G G	No changes. No changes.
6061	6V6	G	Change socket to octal and rewire as follows: Change pin No. 1 to pin No. 5 on octal 2 to 5 3 to 8 4 to 2 5 to 7 7 to 3 8 to 4
			 
6063	6X4	G	No changes.
6064	6AM6	G	No changes.
6065	6BH6	G	Parallel circuits only. Rewire as follows: Change pin No. 6 to pin No. 7 7 to 6
6066	6AT6	G	No changes.
6067	12AU7 5814	G E	No changes. Parallel circuits only. No changes.
6072	12AY7	G	No changes.
6080	6AS7	G	No changes.
6095	6AQ5 6AQ5W 6005	G E E	No changes. No changes. No changes.
6096	6AK5 5654	E G	No changes. No changes.
6097	6AL5 5726	G G	No changes. No changes.
6101	6J6	G	No changes.
6113	6SL7	G	No changes.

RECEIVING TUBE SUBSTITUTIONS

6132-7000

TUBE	SUB.	PERF.	CIRCUIT CHANGES NECESSARY
6132	6CH6	G	No changes.
6134	6AC7	G	No changes.
6135	6C4	G	No changes.
6136	6AU6	G	No changes.
6137	6SK7	G	No changes.
6180	6SN7	G	No changes.
	5692	E	No changes.
6186	6AG5	G	No changes.
6187	6AS6	G	No changes.
	6AS6W	E	No changes.
	5725	E	No changes.
6189	12AU7	G	No changes.
	12AU7WA	E	No changes.
6201	12AT7	G	No changes.
	6060	G	No changes.
6202	6X4	G	No changes.
6265	6BH6	G	No changes.
6350	12BH7	G	Rewire as follows:

Change pin No. 2 to pin No. 3
 3 to 2
 7 to 8
 8 to 7



6485	6AH6	G	No changes.
6550	6L6	G	No changes.
6661	6BH6	G	No changes.
6662	6BJ6	G	No changes.
6663	6AL5	G	No changes.
6669	6AQ5	G	No changes.
6677	6CL6	G	No changes.
6679	12AT7	G	No changes.
6680	12AU7	G	No changes.
6681	12AX7	G	No changes.
7000	6J7	G	No changes.

SUBSTITUTING PICTURE TUBES IN TV RECEIVERS

1. Connecting the External Conductive Tube Coating to Chassis

When a picture tube that does not have an external conductive coating is substituted for one that has the external coating, it is generally necessary to install a metal finger to make contact with the coating in order to connect it to the chassis. Sometimes this finger is attached to the deflection yoke support bracket. Ordinarily a tube that does not have an external coating has a 500- μf capacitor connected from the anode lead to the chassis inside the high-voltage cage. It is normally not necessary to remove this capacitor when substituting a tube that has the external conductive coating.

2. Installing a Capacitor from the Anode Lead to the Chassis

When a tube that does not have the external conductive coating is substituted for one that has the external conductive coating, it is often necessary to install a capacitor from the anode lead to the chassis. In the substitutions listed here we have repeated the same value of 500 μf . Ordinarily this will be satisfactory. In some cases this capacitor will not be necessary. In others best satisfaction may be had with capacitances as high

as 2,000 μf . This is according to individual cases and can be determined by trial. The most convenient location for this capacitor is inside the high-voltage cage.

3. Dimensions

Before attempting any of the substitutions listed here, make sure the substitute tube will fit into the available space. In the magnetic types try to choose a substitute with a neck length similar to the original. Differences in face plate curvatures may make it necessary, in some substitutions listed, to change the mask.

4. Change in Anode Connector

Either the ball-type or cavity-type anode connector is used on picture tubes. Instructions specify when a change is necessary.

5. Replacement or Deletion of Ion Trap

It is necessary to replace the ion trap with the type required by the manufacturer of the substitute tube. Some tubes do not require an ion trap and are being substituted for others requiring either a single or dual ion trap. In these cases,

the instruction is "Remove ion trap." Other tubes requiring a single ion trap can be substituted for by installing a dual ion trap and vice versa. In these cases instructions are given. Some manufacturers of picture tubes are using a new type gun requiring a single ion trap in tubes that formerly used a gun requiring a dual ion trap. It is therefore important to check the individual manufacturer's specification on the substitute tube being used.

6. Electrostatic and Self-Focus Tubes

When using electrostatic or self-focus tubes as substitutions for magnetically focused tubes, it is necessary to remove the focus coil from the neck of the tube and replace it with a magnetic centering device. The focus coil may be left in the receiver circuit-wise, in which case it should be mounted in the cabinet in some position where its magnetic field has no effect on the picture. It may be replaced with a choke or resistor. The picture tube socket may have to be changed when it is necessary to bring out a lead from the focus electrode on the picture tube base except in the case of self-focus or automatic focus types. This lead should be connected to a d-c voltage point in the set which gives best focus. The voltage required normally lies between 50 and 350 volts. Self-focus or automatic focus tubes have a special gun structure within the neck of the tube designed

to focus the tube automatically without the use of an external focus voltage.

7. Substituting Electrostatic or Automatic Focus Types with Magnetic Types

When replacing electrostatic focus types with magnetic focus types, discard the magnetic centering device and install a permanent magnet focusing device. This must be mounted on the yoke support with suitable metal brackets. It is practical to replace an electrostatic focus tube using high-focus voltage with a type using low-focus voltage or a self-focus type. When doing this, it is desirable to remove the focus voltage rectifier as a safety measure.

8. Differences in the Face Plate

Differences in the face plate of the tube have little effect on whether or not they may be substituted. Dark-faced tubes give better contrast than white-faced tubes. Some tubes are frosted to decrease reflections and others have an aluminized back for better contrast and brightness. Aluminized tubes in some cases have higher anode voltage applied and this voltage should be reduced in accordance with manufacturers' specifications when other than aluminized tubes are substituted. When substituting aluminized tubes for white- or gray-faced tubes, sufficient voltage is usually available for satisfactory operation.

PICTURE TUBE SUBSTITUTIONS

TUBE	SUB.	CHANGES NECESSARY
7CP4	7DP4	Change anode connector to cavity type. Connect external conductive coating to chassis. Change ion trap to double.
7DP4	7CP4	Connect a 500- μ f 20-kv capacitor from anode to chassis. Change anode connector to ball type. Remove ion trap.
12KP4	12ZP4 12ZP4A	Install single ion trap. Install single ion trap.
12LP4	12ZP4 12ZP4A	Install single ion trap. Install single ion trap.
12QP4	12ZP4 12ZP4A	Change anode connector to cavity type. Connect external conductive coating to chassis. Change anode connector to cavity type. Connect external conductive coating to chassis.
12TP4	12ZP4	Connect external conductive coating to chassis. Change ion trap to single.
12ZP4	12KP4 12KP4A 12LP4 12LP4A	Remove ion trap. Remove ion trap. Only where 1-1/8 inch greater length is available. Change ion trap to double. Same as for 12LP4.
	12QP4 12QP4A 12TP4 12ZP4A	Connect a 500- μ f 20-kv capacitor from anode to chassis. Change anode connector to ball type. Same as for 12QP4. Only where 1-1/8 inch greater length is available. Connect a 500- μ f 20-kv capacitor from anode to chassis. Change ion trap to double. No changes.
14HP4	14QP4	No changes.
14QP4	14HP4	No changes.
16AEP4	16ABP4	No changes.
17ATP4	17AVP4 17AVP4A	No changes. No changes.
17AVP4	17ATP4 17ATP4A	No changes. No changes.
17QP4	17YP4	No changes.
17YP4	17QP4 17QP4A	No changes. No changes.
20HP4	20HP4D 20LP4 20MP4	No changes. No changes. No changes.
20LP4	20HP4A 20HP4D 20MP4	No changes. No changes. No changes.
20MP4	20HP4A 20HP4D 20LP4	No changes. No changes. No changes.
21ACP4	21ACP4A 21AMP4 21AMP4A 21AQP4 21AQP4A 21BSP4	No changes. No changes. No changes. Connect a 500- μ f 20-kv capacitor from anode to chassis. Same as for 21AQP4. No changes.
21AFP4	21ASP4 (Cont.)	No changes.

PICTURE TUBE SUBSTITUTIONS

21AFP4-21ATP4A

TUBE	SUB.	CHANGES NECESSARY
21AFP4 (Cont.)	21YP4 21YP4A	Connect external conductive coating to ground. Connect external conductive coating to ground.
21ALP4	21ALP4A 21ALP4B 21ANP4 21ANP4A 21ATP4 21ATP4A	No changes. No changes. Connect a 500- μ f 20-kv capacitor from anode to chassis. No changes. No changes. No changes.
21AMP4	21ACP4 21ACP4A 21AMP4A 21AQP4 21AQP4A	No changes. No changes. No changes. Connect a 500- μ f 20-kv capacitor from anode to chassis. No changes.
21AMP4A	21ACP4 21ACP4A 21AMP4 21AQP4	No changes. No changes. No changes. Connect a 500- μ f 20-kv capacitor from anode to chassis.
21ANP4	21ALP4 21ALP4A 21ALP4B 21ATP4	Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis.
21AP4	21ZP4 21ZP4B	This substitute to be used only when changing from metal to glass picture tube. Mask opening must be enlarged. Change anode connector to cavity type. Same as 21AP4 to 21ZP4. Connect external conductive coating to chassis.
21AQP4	21ACP4 21ACP4A 21AMP4 21AMP4A 21AQP4A	Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. No changes.
21AQP4A	21ACP4 21ACP4A 21AMP4 21AMP4A 21AQP4	Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. No changes.
21ARP4	21ARP4A 21JP4 21JP4A	No changes. No changes. No changes.
21ARP4A	21ARP4 21JP4 21JP4A	No changes. No changes. No changes.
21ASP4	21AYP4 21XP4 21XP4A 21YP4 21YP4A	Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis.
21ATP4	21ALP4 21ALP4A 21ALP4B 21ANP4 21ANP4A 21ATP4A	No changes. No changes. No changes. Connect a 500- μ f 20-kv capacitor from anode to chassis. Connect a 500- μ f 20-kv capacitor from anode to chassis. No changes.
21ATP4A	21ALP4 21ALP4A 21ALP4B 21ANP4 21ANP4A 21ATP4	No changes. No changes. No changes. Connect a 500- μ f 20-kv capacitor from anode to chassis. Connect a 500- μ f 20-kv capacitor from anode to chassis. No changes.

TUBE	SUB.	CHANGES NECESSARY
21AUP4	21AUP4A	No changes.
	21AUP4B	No changes.
	21AVP4	No changes.
	21AVP4A	No changes.
	21AVP4B	No changes.
21AUP4A	21AUP4	No changes.
	21AUP4B	No changes.
	21AVP4	No changes.
	21AVP4A	No changes.
	21AVP4B	No changes.
21AUP4B	21AUP4	No changes.
	21AUP4A	No changes.
	21AVP4	No changes.
	21AVP4A	No changes.
	21AVP4B	No changes.
21AVP4	21AUP4	No changes.
	21AUP4A	No changes.
	21AUP4B	No changes.
	21AVP4A	No changes.
	21AVP4B	No changes.
21AVP4A	21AUP4	No changes.
	21AUP4A	No changes.
	21AUP4B	No changes.
	21AVP4	No changes.
	21AVP4B	No changes.
21AVP4B	21AUP4	No changes.
	21AUP4A	No changes.
	21AUP4B	No changes.
	21AVP4	No changes.
	21AVP4A	No changes.
21AYP4	21ASP4	Connect a 500- μ f 25-kv capacitor from anode to chassis.
	21XP4	No changes.
	21XP4A	No changes.
	21YP4	No changes.
	21YP4A	No changes.
21BSP4	21ACPYA	No changes.
21JP4	21ARP4	No changes.
	21ARP4A	No changes.
	21JP4A	No changes.
21JP4A	21ARP4	No changes.
	21ARP4A	No changes.
	21JP4	No changes.
21MP4	21YP4	This substitute to be used only when changing from metal to glass picture tube. Mask opening must be altered. Change anode connector to cavity type.
	21YP4A	Same as 21MP4 to 21YP4 procedure.
21XP4	21ASP4	Connect a 500- μ f 25-kv capacitor from anode to chassis.
	21XP4A	No changes.
	21YP4	No changes.
	21YP4A	No changes.
21XP4A	21ASP4	Connect a 500- μ f 25-kv capacitor from anode to chassis.
	21XP4	No changes.
	21YP4	No changes.
	21YP4A	No changes.
21YP4	21YP4A	No changes.
21YP4A	21YP4	No changes.

PICTURE TUBE SUBSTITUTIONS

24BP4-30BP4

TUBE	SUB.	CHANGES NECESSARY
24BP4		No practical substitute.
24CP4	24CP4A 24QP4 24TP4 24VP4 24VP4A 24XP4	No changes. No changes. No changes. No changes. No changes. Connect a 500- μ f 25-kv capacitor from anode to chassis.
24DP4	24DP4A 24YP4 24ZP4	No changes. No changes. No changes.
24QP4	24CP4 24CP4A 24TP4 24VP4 24VP4A 24XP4	No changes. No changes. No changes. No changes. No changes. Connect a 500- μ f 25-kv capacitor from anode to chassis.
24TP4	24CP4 24CP4A 24QP4 24VP4 24VP4A 24XP4	No changes. No changes. No changes. No changes. No changes. Connect a 500- μ f 25-kv capacitor from anode to chassis.
24VP4	24CP4 24CP4A 24TP4 24VP4A 24XP4	No changes. No changes. No changes. No changes. Connect a 500- μ f 25-kv capacitor from anode to chassis.
24VP4A	24CP4 24CP4A 24TP4 24VP4 24XP4	No changes. No changes. No changes. No changes. Connect a 500- μ f 25-kv capacitor from anode to chassis.
24XP4	24CP4 24CP4A 24QP4 24TP4 24VP4 24VP4A	Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis. Connect external conductive coating to chassis.
24YP4	24DP4 24DP4A 24ZP4	No changes. No changes. No changes.
24ZP4	24DP4 24YP4	No changes. No changes.
27AP4		No practical substitute.
27MP4	27EP4	This substitute to be used only when changing from metal to glass picture tube. Mask opening may be altered. Change anode connector to cavity type.
27SP4	27UP4	No changes.
27UP4	27SP4	No changes.
30BP4		No practical substitute.


EUROPEAN — AMERICAN TUBE SUBSTITUTION

EUROPEAN	AMERICAN	PERF.	CIRCUIT CHANGES NECESSARY
B36	12SN7	G	No changes.
B65	6SN7	G	No changes.
B152	12AT7	G	No changes.
B309	12AT7	G	No changes.
B319	7AN7	G	No changes.
B329	12AU7	E	No changes.
B719	6AQ8	G	No changes.
D63	6H6	G	No changes.
D77	6AL5	E	No changes.
D152	6AL5	G	No changes.
DA90	1A3	E	No changes.
DAC32	1H5	E	No changes.
	1LH4	G	Reverse 1LH4 to DAC32 procedure.
DAF91	1LD5	G	Reverse 1LD5 to DAF91 procedure.
	1S5	E	No changes.
	1U5	G	Reverse 1U5 to DAF91 procedure.
DAF96	1AH5	E	No changes.
DC70	6375	G	No changes.
DC80	1E3	E	No changes.
DCC90	3A5	E	No changes.
DD6	6AL5	E	No changes.
DD7	6AL5	G	No changes.
DF33	1LC5	G	Reverse 1LC5 to DF33 procedure.
	1LN5	G	Reverse 1LN5 to DF33 procedure.
	1N5	E	No changes.
DF62	1AD4	E	No changes.
DF91	1T4	E	No changes.
DF92	1L4	G	No changes.
DF96	1AF4	G	No changes.
	1AJ4	E	No changes.
DF904	1U4	G	No changes.
DH63	6Q7	G	No changes.
DH77	6AT6	E	No changes.
DH149	7C6	G	No changes.
DK32	1A7	E	No changes.
	1LA6	G	Reverse 1LA6 to DK32 procedure.
DK91	1R5	E	No changes.
DK92	1AC6	E	No changes.

EUROPEAN-AMERICAN TUBE SUBSTITUTION

DK96-ECC91

EUROPEAN	AMERICAN	PERF.	CIRCUIT CHANGES NECESSARY
DK96	1AB6	E	No changes.
DL33	3Q5	E	No changes.
DL35	1C5	E	No changes.
DL36	1Q5	E	No changes.
DL91	1S4	G	No changes.
DL92	3S4	E	No changes.
DL93	3A4	E	No changes.
DL94	3Y4	E	No changes.
DL95	3Q4	E	No changes.
DL96	3C4	E	No changes.
DM70	1M3	G	No changes.
DP61	6AK5	E	No changes.
DY30	1B3	G	No changes.
DY80	1X2A	G	No changes.
EA76	6489	E	No changes.
EAA91	6AL5	G	No changes.
EABC80	6AK8 6T8	E G	No changes. No changes.
EB34	6H6	E	Parallel circuits only. No changes.
EB91	6AL5	E	No changes.
EBC33	1639	G	No changes.
EBC90	6AT6	E	No changes.
EBC91	6AV6	G	No changes.
EBF80	6N8	E	No changes.
EC70	5718	G	No changes.
EC80	6Q4	E	No changes.
EC81	6R4	E	No changes.
EC90	6C4	E	No changes.
EC91	6AQ4	E	No changes.
EC92	6AB4	E	No changes.
ECC33	6SN7	G	Parallel circuits only. No changes.
ECC35	6SL7	G	Parallel circuits only. No changes.
ECC81	12AT7	E	No changes.
ECC82	12AU7	E	No changes.
ECC83	12AX7	E	No changes.
ECC85	6AQ8	E	No changes.
ECC91	6J6	E	No changes.

EUROPEAN	AMERICAN	PERF.	CIRCUIT CHANGES NECESSARY
ECF82	6U8	E	No changes.
ECH35	6E8	E	No changes.
	6P8G	E	Parallel circuits only. No changes.
ECH81	6AJ8	E	No changes.
ECL80	6AB8	E	No changes.
ECL82	6BM8	E	No changes.
EF70	6487	G	No changes.
EF71	5899	G	No changes.
EF72	5840	G	No changes.
EF73	6488	E	No changes.
EF80	6BX6	E	No changes.
EF85	6BY7	E	No changes.
EF86	6267	E	No changes.
EF91	6AM6	E	No changes.
EF92	6CQ6	E	No changes.
EF93	6BA6	E	No changes.
EF94	6AU6	G	No changes.
EF95	6AK5	E	No changes.
EF96	6AG5	G	No changes.
EH90	6CS6	E	No changes.
EK90	6BE6	E	No changes.
EL33	6M6G	E	No changes.
EL34	6CA7	G	No changes.
EL37	6L6	E	No changes.
	5881	E	No changes.
EL38	6CN6	E	No changes.
EL70	6373	G	No changes.
EL81	6CJ6	E	No changes.
EL83	6CK6	E	No changes.
EL84	6BQ5	E	No changes.
EL85	6BN5	E	No changes.
EL90	6AQ5	E	No changes.
EL91	6AK6	G	Rewire as follows:
			Change pin No. 2 to pin No. 7 & 2 to 6
			
			ORIG
	6AM5	E	No changes.
EL821	6CH6	G	No changes.



EUROPEAN-AMERICAN TUBE SUBSTITUTION

EM34-KT63

EUROPEAN	AMERICAN	PERF.	CIRCUIT CHANGES NECESSARY
EM34	6CD7	E	No changes.
EM80	6BR5	E	No changes.
EN91	2D21	E	No changes.
EQ80	6BE7	E	No changes.
EY51	6X2	E	No changes.
EY70	5641	G	No changes.
EY80	6U3	E	No changes.
EY84	6374	E	No changes.
EZ35	6X5	E	No changes.
EZ80	6V4	E	No changes.
EZ81	6BW4	E	No changes.
EZ90	6X4	E	No changes.
GZ30	5Z4	E	No changes.
GZ32	5V4	E	No changes.
GZ34	5U4	G	No changes.
H52	5U4	G	No changes.
H63	6F5	E	No changes.
HBC90	12AT6	E	No changes.
HBC91	12AV6	G	No changes.
HD14	1H5	G	No changes.
HD30	3B4	E	No changes.
HF93	12BA6	E	No changes.
HF94	12AU6	G	No changes.
HK90	12BE6	E	No changes.
HL90	19AQ5	E	No changes.
HL92	50C5	E	No changes.
HM04	6BE6	E	No changes.
HY90	35W4	E	No changes.
KBC32	1H6	G	Reverse 1H6 to KBC32 procedure.
KF35	1E5	E	No changes.
KK32	1C6	G	Reverse 1C6 to KK32 procedure.
	1C7	G	No changes.
	1D7	G	Parallel circuits only. No changes.
KL35	1F4	G	Reverse 1F4 to KL35 procedure.
	1F5	G	No changes.
KT32	25L6	G	No changes.
KT63	6F6	G	No changes.
	6J7	G	No changes.

EUROPEAN	AMERICAN	PERF.	CIRCUIT CHANGES NECESSARY
KT66	6L6	E	Parallel circuits only. No changes
KT81	7C5	G	No changes.
KTW63	6K7	G	No changes.
L63	6J5	G	No changes.
L77	6C4	E	No changes.
LN152	6AB8	G	No changes.
LZ319	8A8	G	No changes.
N14	1C5	G	No changes.
N17	3S4	E	No changes.
N18	3Q4	E	No changes.
N19	3V4	E	No changes.
N77	6AM5	E	No changes.
N78	6BJ5	E	No changes.
N144	6AN5	G	No changes.
N148	7C5	G	No changes.
N152	21A6	G	No changes.
N329	16A5	G	No changes.
N359	21A6	G	No changes.
N709	6BQ5	G	No changes.
PABC80	9AK8	E	No changes.
PCC84	7AN7	E	No changes.
PCC85	9AQ8	E	No changes.
PCF80	8A8	G	No changes.
	9A8	E	No changes.
PCF82	9U8	E	No changes.
PL21	2D21	E	No changes.
PL81	21A6	E	No changes.
PL82	16A5	E	No changes.
PL83	15A6	E	No changes.
PY80	19X3	E	No changes.
PY81	17Z3	E	No changes.
PY82	19Y3	E	No changes.
QQV03-10	6360	G	No changes.
QQV03-28	6252	G	No changes.
QV05-25	807	G	No changes.
SP6	6AM6	E	No changes.

EUROPEAN-AMERICAN TUBE SUBSTITUTION

TD03-10-6A7E

EUROPEAN	AMERICAN	PERF.	CIRCUIT CHANGES NECESSARY
TD03-10	5861	G	No changes.
U50	5Y3	G	No changes.
U52	5U4	G	No changes.
U70	6X5	G	No changes.
U78	6X4	E	No changes.
U147	6X5	G	No changes.
U149	7Y4	G	No changes.
U154	19Y3	G	No changes.
U319	19Y3	G	No changes.
UF41	12AC5	E	No changes.
UBC41	14L7	E	No changes.
UCH42	14K7	E	No changes.
W17	1T4	E	No changes.
W63	6K7	G	No changes.
W77	6065	E	No changes.
W149	7B7	G	No changes.
W179	6BY7	G	No changes.
X14	1A7	G	No changes.
X17	1R5	E	No changes.
X18	1AC6	E	No changes.
X63	6A8	G	No changes.
X79	6AE8	E	No changes.
X81	7S7	G	No changes.
X148	7S7	G	No changes.
Y61	6U5	E	No changes.
Z14	1N5	G	No changes.
Z63	6J7	G	No changes.
Z77	6AM6	G	No changes.
	6064	E	No changes.
Z152	6BX6	G	No changes.
Z179	6BX6	G	No changes.
ZD17	1S5	E	No changes.
ZD19	1S5	G	No changes.
1F3	1T4	E	No changes.
1FD9	1S5	E	No changes.
1P10	3SF	E	No changes.
6A7E	6A7	E	No changes.

EUROPEAN	AMERICAN	PERF.	CIRCUIT CHANGES NECESSARY
6D2	6AL5	G	No changes.
6F12	6AM6	G	No changes.
8D3	6AM6	E	No changes.
30C1	8A8	G	No changes.
30L1	7AN7	G	No changes.

OA2-1C6

AMERICAN — EUROPEAN TUBE SUBSTITUTION

AMERICAN	EUROPEAN	PERF.	CIRCUIT CHANGES NECESSARY
OA2	150C2	E	No changes.
OA4	Z300T	E	No changes.
OB2	108C1	G	No changes.
OD3	150C3	E	No changes.
OE3	85A1	E	No changes.
OG3	85A2	E	No changes.
1A3	DA90	E	No changes.
1A7	DK32	E	No changes.
	X14	G	No changes.
1AB6	DK96	E	No changes.
1AC6	DK92	E	No changes.
	X18	E	No changes.
1AD4	DF62	E	No changes.
1AF4	DF96	G	No changes.
1AH5	DAF96	E	No changes.
1AJ4	DF96	E	No changes.
1B3	DY30	G	No changes.
1C5	DL35	E	No changes.
	N14	G	No changes.
1C6	KK32	G	Rewire as follows. Change socket to six pin.








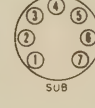








Change Pin No. 1 to pin No. 2
 2 to 3
 5 to 4
 4 to 5
 3 to 6
 6 to 7



AMERICAN-EUROPEAN TUBE SUBSTITUTION

1C7-1Q5

AMERICAN	EUROPEAN	PERF.	CIRCUIT CHANGES NECESSARY
1C7	KK32	G	No changes.
1D7	KK32	G	Parallel circuits only. No changes.
1E3	DC80	E	No changes.
1E5	KF35	G	No changes.
1F4	KL35	G	Rewire as follows: Change to five pin socket. Change pin No. 1 to pin No. 2 2 to 3 4 to 4 3 to 5 5 to 7
			 
1F5	KL35	G	No changes.
1H5	DAC32	E	No changes.
	HD14	G	No changes.
1H6	KBC32	G	Rewire as follows: Change pin No. 6 to grid cap.
1L4	DF92	G	No changes.
1LA6	DK32	G	Rewire as follows: Change pin No. 1 to pin No. 2 2 to 3 5 to 4 4 to 5 6 to Cap 3 to 6 8 to 7
			 
1LC5	DF33	G	Rewire as follows: Change pin No. 1 to pin No. 2 2 to 3 3 to 4 6 to Cap 8 to 7 5 to 7
			 
1LD5	DAF91	G	Rewire as follows: Change pin No. 1 to pin No. 1 4 to 3 3 to 4 2 to 5 6 to 6 8 to 7
			 
1LH4	DAC32	G	Rewire as follows: Change pin No. 1 to pin No. 2 2 to 3 4 to 5 6 to Cap 8 to 7
			 
1LN5	DF33	G	Rewire as follows: Change pin No. 1 to pin No. 2 2 to 3 3 to 4 6 to Cap 8 to 7 5 to 7
			 
1M3	DM70	G	No changes.
1N5	DF33	E	No changes.
	Z14	G	No changes.
1Q5	DL36	E	No changes.

AMERICAN	EUROPEAN	PERF.	CIRCUIT CHANGES NECESSARY	
1R5	DK91	E	No changes.	
	X17	E	No changes.	
1S4	DL91	G	No changes.	
1S5	DAF91	E	No changes.	
	ZD17	E	No changes.	
	ZD19	G	No changes.	
	1FD9	E	No changes.	
1T4	DF91	E	No changes.	
	W17	E	No changes.	
	1F3	E	No changes.	
1U4	DF904	G	No changes.	
1U5	DAF91	G	Rewire as follows:	
			Change pin No. 4	to pin No. 3
			3	to 4
			2	to 5
			6	to 6
				
1X2A	DY80	G	No changes.	
2D21	EN91	E	No changes.	
	PL21	E	No changes.	
3A4	DL93	E	No changes.	
3A5	DCC90	E	No changes.	
	DL99	G	No changes.	
3B4	HD30	E	No changes.	
3C4	DL96	E	No changes.	
3Q4	DL95	E	No changes.	
	N18	E	No changes.	
3Q5	DL33	E	No changes.	
3S4	DL92	E	No changes.	
	N17	E	No changes.	
	1P10	E	No changes.	
3V4	DL94	E	No changes.	
	N19	E	No changes.	
5U4	GZ34	G	No changes.	
	H52	G	No changes.	
	U52	G	No changes.	
5V4	GZ32	E	No changes.	
5Y3	U50	G	No changes.	
5Z4	GZ30	E	No changes.	
6A7	6A7E	E	No changes.	
6A8	X63	G	No changes.	
6AB4	EC92	E	No changes.	
6AB8	ECL80	E	No changes.	
	SN152	G	No changes.	
6AE8	X79	E	No changes.	
6AG5	EF96	G	No changes.	

AMERICAN-EUROPEAN TUBE SUBSTITUTION

6AJ8-6CA7

AMERICAN	EUROPEAN	PERF.	CIRCUIT CHANGES NECESSARY
6AJ8	ECH81	E	No changes.
	DP61	E	No changes.
6AK5	EF95	E	No changes.
6AK6	EL91	G	Reverse EL91 to 6AK6 procedure.
6AK8	EABC80	E	No changes.
6AL5	D77	E	No changes.
	DD6	E	No changes.
	DD7	G	No changes.
	D152	G	No changes.
	EAA91	G	No changes.
	EB91	E	No changes.
6AM5	6D2	G	No changes.
	EL91	E	No changes.
	N77	E	No changes.
	N144	G	No changes.
6AM6	EF91	E	No changes.
	SP6	E	No changes.
	Z77	G	No changes.
	6F12	G	No changes.
	8D3	E	No changes.
6AQ4	EC91	E	No changes.
6AQ5	EL90	E	No changes.
6AQ8	B719	G	No changes.
	ECC85	E	No changes.
6AT6	DH77	E	No changes.
	EBC90	E	No changes.
6AU6	EF94	G	No changes.
6AV6	EBC91	G	No changes.
6BA6	EF93	E	No changes.
	HMO4	E	No changes.
6BE6	EK90	E	No changes.
6BE7	EQ80	E	No changes.
6BJ5	N78	E	No changes.
6BM8	ECL82	E	No changes.
6BN5	EL85	E	No changes.
6BQ5	EL84	E	No changes.
	N709	G	No changes.
6BR5	EM80	E	No changes.
6BW4	EZ81	E	No changes.
6BX6	EF80	E	No changes.
	Z152	G	No changes.
	Z179	G	No changes.
6BY7	EF85	E	No changes.
	W179	G	No changes.
6C4	EC90	E	No changes.
	L77	E	No changes.
6CA7	EL34	G	No changes.

AMERICAN	EUROPEAN	PERF.	CIRCUIT CHANGES NECESSARY
6CD7	EM34	E	No changes.
6CH6	EL821	G	No changes.
6CJ6	EL81	E	No changes.
6CK6	EL83	G	No changes.
6CN6	EL38	E	No changes.
6CQ6	EF92	E	No changes.
6CS6	EH90	E	No changes.
6E8	ECH35	E	No changes.
6F5	H63	E	No changes.
6F6	KT63	G	No changes.
6H6	EB34	E	Parallel circuits only. No changes.
	D63	G	No changes.
6J5	L63	G	No changes.
6J6	ECC91	E	No changes.
6J7	KT63	G	No changes.
	Z63	G	No changes.
6K7	KTW63	G	No changes.
	W63	G	No changes.
6L6	EL37	E	No changes.
	KT66	E	Parallel circuits only. No changes.
6M6G	EL33	E	No changes.
6N8	EBF80	E	No changes.
6P8G	ECH35	E	Parallel circuits only. No changes.
6Q4	EC80	E	No changes.
6Q7	DH63	G	No changes.
6R4	EC81	E	No changes.
6SL7	ECC35	G	Parallel circuits only. No changes.
6SN7	B65	G	No changes.
	ECC33	G	Parallel circuits only. No changes.
6T8	EABC80	G	No changes.
6U3	EY80	E	No changes.
6U5	Y61	E	No changes.
6U8	ECF82	E	No changes.
6V4	EZ80	E	No changes.
6X2	EY51	E	No changes.
6X4	EZ90	E	No changes.
	U78	E	No changes.
6X5	EZ35	E	No changes.
	U147	G	No changes.
	U70	G	No changes.

AMERICAN-EUROPEAN TUBE SUBSTITUTION

7AN7-21A6

AMERICAN	EUROPEAN PERF.		CIRCUIT CHANGES NECESSARY
7AN7	B319	G	No changes.
	PCC84	E	No changes.
	30L1	G	No changes.
7B7	W149	G	No changes.
7C5	KT81	G	No changes.
	N148	G	No changes.
7C6	DH149	G	No changes.
7S7	X81	G	No changes.
	X148	G	No changes.
7Y4	U149	G	No changes.
8A8	LZ319	G	No changes.
	PCF80	G	No changes.
	30C1	G	No changes.
9A8	PCF80	E	No changes.
9AK8	PABC80	E	No changes.
9AQ8	PCC85	E	No changes.
9U8	PCF82	E	No changes.
12AC5	UF41	E	No changes.
12AT6	HBC90	E	No changes.
12AT7	B152	G	No changes.
	B309	G	No changes.
	ECC81	E	No changes.
12AU6	B329	E	No changes.
	ECC82	E	No changes.
	HF94	G	No changes.
12AV6	HBC91	G	No changes.
12AX7	ECC83	E	No changes.
12BA6	HF93	E	No changes.
12BE6	HK90	E	No changes.
12SN7	B36	G	No changes.
14K7	UCH42	E	No changes.
14L7	UBC41	E	No changes.
15A6	PL83	E	No changes.
16A5	N329	G	No changes.
	PL82	E	No changes.
17Z3	PY81	E	No changes.
19AQ5	HL90	E	No changes.
19X3	PY80	E	No changes.
19Y3	U154	G	No changes.
	U319	G	No changes.
	PY82	E	No changes.
21A6	N152	G	No changes.
	N359	G	No changes.
	PL81	E	No changes.

AMERICAN	EUROPEAN	PERF.	CIRCUIT CHANGES NECESSARY
25L6	KT32	G	No changes.
35W4	HY90	E	No changes.
50C5	HL92	E	No changes.
807	QV05-25	G	No changes.
1639	EBC33	G	No changes.
5641	EY70	G	No changes.
5718	EC70	G	No changes.
5840	EF72	G	No changes.
5861	TD03-10	G	No changes.
5899	EF71	G	No changes.
6064	Z77	G	No changes.
6065	W77	G	No changes.
6252	QQV03-28	G	No changes.
6267	EF86	E	No changes.
6360	QQV03-10	G	No changes.
6373	EL70	G	No changes.
6374	EY84	E	No changes.
6375	DC70	G	No changes.
6487	EF70	G	No changes.
6488	EF73	E	No changes.
6489	EA76	E	No changes.

CUMULATIVE INDEX

The following indices contain all the tubes listed in the *Receiving Tube Substitution Guidebook*, including those given in the First, Second and Third Supplements, for which substitutions are given.

Where (0) precedes the page number, the substitution information is given on the page referred to in the original *Receiving Tube Substitution Guidebook*; where (1) precedes the page number, the substitution information is given on the page referred to in the First Supplement; where (2) precedes the page number, the substitution information is given on the page referred to in the Second Supplement; where (3) precedes the page number, the substitution information is given on the page referred to in the Third Supplement.

Page references to European substitutes for American tubes have been included under the respective American tube numbers, and are asterisked. Page references to American substitutes for European tubes are listed in the European Index.

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1A4	(0)33, 34 (1)14	1AH6	(3)1	1D7	(0)38 (3)45*
1A5	(0)34 (1)14	1AJ4	(3)1, 44*	1D8	(0)38
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1F6	(0)38	1M3	(3)2, 45*	1W4	(0)48 (1)19
1F7	(0)39	1N5	(0)44 (1)18 (3)45*	1W5	(0)48
1G4	(0)39	1N6	(0)44, 45	1X2	(0)48 (1)19, 20 (2)1
1G5	(0)39 (1)15	1P5	(0)45 (1)18	1X2A	(1)20 (2)1 (3)46*
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1H4	(0)39 (1)15	1Q6	(0)45	1Z2	(0)48 (1)20
1H5	(0)39 (1)15 (3)45*	1R4/1294	(0)45	2A3	(0)48 (1)20 (3)2
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		6AC7	(0)59 (3)9	6AK7	(0)62
5V6	(3)9	6AC7/1852	(0)59	6AK8	(2)3 (3)47*
5W4	(0)54 (2)1 (3)9	6AD4	(0)59	6AL5	(0)62 (1)23 (3)10, 47*
5X3	(0)54	6AD5	(0)59		
5X4	(0)54 (2)1	6AD6	(0)59	6AL6	(0)62 (1)23 (3)10
5X8	(3)9	6AD7	(0)60 (1)22		
5Y3	(0)55 (2)1 (3)9, 46*	6AD8	(3)9	6AL7	(0)62
5Y4	(0)55 (2)1 (3)9	6AE5	(0)60 (1)22	6AM4	(2)3
		6AE6	(0)60	6AM5	(0)62 (2)3 (3)47*
5Z3	(0)55 (2)1	6AE7	(3)9		
5Z4	(0)56 (2)1 (3)9, 46*	6AE8	(3)46*	6AM6	(0)62, 63 (3)10, 47*
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6AR6	(0)64 (1)23	6BA6	(0)67 (1)24 (2)3	6BK6	(0)69 (3)13
6AR7	(0)64		(3)11, 47*	6BK7	(2)4 (3)13
6AR8	(3)10	6BA7	(0)67	6BL4	(3)13
6AS5	(0)64 (2)3	6BA8	(3)12	6BL7	(1)24 (2)4
6AS6	(0)64 (3)10	6BC4	(3)12	6BM5	(2)4
6AS7	(3)10	6BC5	(0)67 (1)24 (2)3 (3)12	6BM8	(3)47*
6AS7G	(0)64	6BC7	(0)68	6BN4	(3)13
6AS8	(3)10	6BC8	(3)12	6BN5	(3)13, 47*
6AT6	(0)64, 65 (3)10, 47*	6BD4A	(3)12	6BN6	(0)69 (3)13
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6AU4	(3)10	6BD6	(0)68 (3)12	6BN8	(3)14
6AU5	(0)65 (1)23	6BD7	(0)68	6BQ5	(3)47*
6AU6	(0)65, 143 (1)24 (3)11, 47*	6BE6	(0)68 (3)12, 47*	6BQ6	(0)69 (2)4 (3)14
6AU8	(3)11	6BE7	(3)12, 47*	6BQ7	(1)24 (2)4 (3)14
6AV4	(3)11	6BE8	(3)12	6BR5	(3)47*
6AV5	(0)65	6BF5	(0)68	6BR7	(3)14
6AV6	(0)65 (2)3 (3)11, 47*	6BF6	(0)68	6BR8	(3)14
6AW7	(0)65	6BF7	(0)68	6BS5	(3)14
6AW8	(3)11	6BG6	(0)68 (1)24 (3)12	6BS7	(3)14, 15
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6AX8	(3)11	6BH8	(3)13	6BU5	(3)15
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6B5	(0)66	6BJ7	(3)13	6BV7	(3)15
6B6	(0)66	6BJ8	(3)13	6BV8	(3)15
6B7	(0)67			6BW4	(3)15, 47*

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6BX7	(2)4	6CH8	(3)17	6E6	(0)73 (1)25
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6BY7	(2)5 (3)47*	6CL8	(3)18	6F5	(0)73, 74 (3)48*
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6BZ7	(2)5 (3)16	6CM8	(3)18	6F7	(0)74 (1)25
6BZ8	(3)16	6CN6	(3)18, 48*	6F8	(0)74 (1)25
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5635	(0)140	5726	(0)141 (3)28	5915	(0)142 (3)29
5636	(0)140	5727	(3)29	5930	(3)29
5637	(3)28	5731	(0)141	5931	(0)142 (3)29
5638	(3)28	5732	(3)29	5932	(0)142 (3)29
5641	(3)50*	5744	(0)141	5933	(3)29
5642	(1)44	5749	(3)29	5961	(3)29
5643	(0)140	5750	(3)29	5963	(3)29
5646	(0)140	5751	(3)29	5964	(3)29
5647	(0)140	5751WA	(3)29	5965	(3)29
5654	(0)140 (3)28	5783	(0)141	5992	(3)30
5670	(0)140 (2)12 (3)28	5784	(0)141	5998	(3)30
5670WA	(3)28	5785	(0)141	6005	(3)30
5672	(0)140	5787	(0)141	6006	(3)30
5676	(0)140	5812	(0)141	6046	(3)30
5677	(0)140	5814	(3)29	6057	(3)30
5678	(0)140	5823	(0)141	6058	(3)30
5679	(0)140 (3)28	5824	(0)141 (3)29	6059	(3)30
5686	(0)140	5838	(3)29	6060	(3)30
5687	(0)140	5839	(3)29	6061	(3)30
5691	(0)140	5840	(0)141 (3)50*	6063	(3)30
5692	(0)141 (3)28	5847	(0)141	6064	(3)30, 50*
5693	(0)141	5861	(3)50*	6065	(3)30, 50*
5694	(0)141	5871	(3)29	6066	(3)30
5697	(0)141	5879	(0)141	6067	(3)30
5702	(0)141	5881	(1)44 (3)29	6072	(3)30
5703	(0)141	5896	(0)141	6080	(3)30
5704	(0)141	5897	(0)141	6095	(3)30
5718	(0)141 (3)50*	5898	(0)142	6096	(3)30
5719	(0)141	5899	(0)142 (3)29, 50*	6097	(3)30
5722	(0)141	5900	(0)142 (3)29	6101	(3)30
				6113	(3)30

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6135	(3)31	6374	(3)50*	7000	(0)144 (3)31
6136	(3)31	6375	(3)50*	7700	(0)144
6137	(3)31	6485	(3)31	9001	(0)142
6180	(3)31	6487	(3)50*	9002	(0)142
6186	(3)31	6488	(3)50*	9003	(0)142
6187	(3)31	6489	(3)50*	9004	(0)142
6189	(3)31	6550	(3)31	9005	(0)142
6201	(3)31	6661	(3)31	9006	(0)142
6202	(3)31	6662	(3)31	KT66	(1)43
6252	(3)50*	6663	(3)31	X6030	(0)142
6265	(3)31	6669	(3)31	XXD	(1)44
6267	(3)50*	6677	(3)31	XXFM	(0)142
6350	(3)31	6679	(3)31	XXL	(0)142

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7HP4	(2)15	10MP4A	(2)15	12UP4A	(2)17
7NP4	(2)15	12JP4	(2)16	12UP4B	(2)17
7QP4	(2)15	12KP4	(2)16 (3)34	12VP4	(2)17
7WP4	(2)15	12KP4A	(2)16	12ZP4	(3)34
8AP4	(2)15	12LP4	(2)16 (3)34	14BP4	(2)18
8AP4A	(2)15	12LP4A	(2)16	14BP4A	(2)18
10BP4	(2)15	12QP4	(2)16, 17 (3)34	14CP4	(2)18
10BP4A	(2)15	12QP4A	(2)16, 17	14DP4	(2)18
10CP4	(2)15	12RP4	(2)17	14EP4	(2)18
10EP4	(2)15			14FP4	(2)18
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15AP4	(2)18	16ZP4	(2)22	19JP4	(2)24
15CP4	(2)18	17AP4	(2)22	20CP4	(2)24
15DP4	(2)19	17ATP4	(3)34	20CP4A	(2)24
16AEP4	(3)34	17AVP4	(3)34	20CP4C	(2)24, 25
16AP4	(2)19	17BP4	(2)22	20DP4	(2)25
16AP4A	(2)19	17BP4A	(2)22	20DP4A	(2)25
16CP4	(2)19	17BP4B	(2)22	20FP4	(2)25
16DP4	(2)19	17BP4C	(2)22	20GP4	(2)25
16DP4A	(2)19	17CP4	(2)22	20HP4	(2)25 (3)34
16EP4	(2)19	17CP4A	(2)22	20HP4B	(2)25
16EP4A	(2)19	17FP4	(2)23	20LP4	(3)34
16EP4B	(2)19	17FP4A	(2)23	20MP4	(3)34
16FP4	(2)19	17HP4	(2)23	21ACP4	(3)34
16GP4	(2)19	17HP4A	(2)23	21AFP4	(3)34, 35
16HP4	(2)19	17JP4	(2)23	21ALP4	(3)35
16HP4A	(2)19	17KP4	(2)23	21AMP4	(3)35
16JP4	(2)19, 20	17LP4	(2)23	21AMP4A	(3)35
16JP4A	(2)19, 20	17LP4A	(2)23	21ANP4	(3)35
16KP4	(2)20	17QP4	(2)23 (3)34	21AP4	(3)35
16KP4A	(2)20	17RP4	(2)23	21AQP4	(3)35
16LP4	(2)20	17SP4	(2)23	21AQP4A	(3)35
16LP4A	(2)20	17UP4	(2)23	21ARP4	(3)35
16MP4	(2)20	17VP4	(2)23	21ARP4A	(3)35
16MP4A	(2)20	17YP4	(3)34	21ASP4	(3)35
16QP4	(2)20	19AP4	(2)24	21ATP4	(3)35
16RP4	(2)20	19AP4A	(2)24	21ATP4A	(3)35
16SP4	(2)21	19AP4B	(2)24	21AUP4	(3)36
16SP4A	(2)21	19AP4C	(2)24	21AUP4A	(3)36
16TP4	(2)21	19AP4D	(2)24	21AUP4B	(3)36
16UP4	(2)21	19DP4	(2)24	21AVP4	(3)36
16VP4	(2)21	19DP4A	(2)24	21AVP4A	(3)36
16WP4	(2)21	19EP4	(2)24	21AVP4B	(3)36
16WP4A	(2)21	19FP4	(2)24	21AYP4	(3)36
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21EP4B	(2)25	21ZP4A	(2)26	24YP4	(3)37
21FP4	(2)25	22AP4	(2)26	24ZP4	(3)37
21FP4A	(2)26	22AP4A	(2)26	27AP4	(3)37
21JP4	(3)36	24AP4	(2)26	27EP4	(2)26
21JP4A	(3)36	24AP4B	(2)26	27GP4	(2)26
21KP4	(2)26	24BP4	(3)37	27MP4	(3)37
21KP4A	(2)26	24CP4	(3)37	27NP4	(2)26
21MP4	(3)36	24DP4	(3)37	27RP4	(2)26
21WP4	(2)26	24QP4	(3)37	27SP4	(3)37
21XP4	(3)36	24TP4	(3)37	27UP4	(3)37
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B152	(3)38	DD6	(3)38	DL33	(3)39
B309	(3)38	DD7	(3)38	DL35	(3)39
B319	(3)38	DF33	(3)38	DL36	(3)39
B329	(3)38	DF62	(3)38	DL91	(3)39
B719	(3)38	DF91	(3)38	DL92	(3)39
D63	(3)38	DF92	(3)38	DL93	(3)39
D77	(3)38	DF96	(3)38	DL94	(3)39
D152	(3)38	DF904	(3)38	DL95	(3)39
DA90	(3)38	DH63	(3)38	DL96	(3)39
DAC32	(3)38	DH77	(3)38	DM70	(3)39
DAF91	(3)38	DH149	(3)38	DP61	(3)39
DAF96	(3)38	DK32	(3)38	DY30	(3)39
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EABC80	(3)39	EF94	(3)40	HBC91	(3)41
EB34	(3)39	EF95	(3)40	HD14	(3)41
EB91	(3)39	EF96	(3)40	HD30	(3)41
EBC33	(3)39	EH90	(3)40	HF93	(3)41
EBC90	(3)39	EK90	(3)40	HF94	(3)41
EBC91	(3)39	EL33	(3)40	HK90	(3)41
EBF80	(3)39	EL34	(3)40	HL90	(3)41
EC70	(3)39	EL37	(3)40	HL92	(3)41
EC80	(3)39	EL38	(3)40	HM04	(3)41
EC81	(3)39	EL70	(3)40	HY90	(3)41
EC90	(3)39	EL81	(3)40	KBC32	(3)41
EC91	(3)39	EL83	(3)40	KF35	(3)41
EC92	(3)39	EL84	(3)40	KK32	(3)41
ECC33	(3)39	EL85	(3)40	KL35	(3)41
ECC35	(3)39	EL90	(3)40	KT32	(3)41
ECC81	(3)39	EL91	(3)40	KT63	(3)41
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ECC83	(3)39	EM34	(3)41	KT81	(3)42
ECC85	(3)39	EM80	(3)41	KTW63	(3)42
ECC91	(3)39	EN91	(3)41	L63	(3)42
ECF82	(3)40	EQ80	(3)41	L77	(3)42
ECH35	(3)40	EY51	(3)41	LN152	(3)42
ECH81	(3)40	EY70	(3)41	LZ319	(3)42
ECL80	(3)40	EY80	(3)41	N14	(3)42
ECL82	(3)40	EY84	(3)41	N17	(3)42
EF70	(3)40	EZ35	(3)41	N18	(3)42
EF71	(3)40	EZ80	(3)41	N19	(3)42
EF72	(3)40	EZ81	(3)41	N77	(3)42
EF73	(3)40	EZ90	(3)41	N78	(3)42
EF80	(3)40	GZ30	(3)41	N144	(3)42
EF85	(3)40	GZ32	(3)41	N148	(3)42
EF86	(3)40	GZ34	(3)41	N152	(3)42
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PCC84	(3)42	U147	(3)43	Z14	(3)43
PCC85	(3)42	U149	(3)43	Z63	(3)43
PCF80	(3)42	U154	(3)43	Z77	(3)43
PCF82	(3)42	U319	(3)43	Z152	(3)43
PL21	(3)42	UBC41	(3)43	Z179	(3)43
PL81	(3)42	UCH42	(3)43	ZD17	(3)43
PL82	(3)42	UF41	(3)43	ZD19	(3)43
PL83	(3)42	W17	(3)43	1F3	(3)43
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PY81	(3)42	W77	(3)43	1P10	(3)43
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